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ABSTRACT

This publication, one part of a three-part NSTA series on energy-environment, is a sampling of current energy literature. The references are divided into four separate categories, each directed for a specific audience: readings for teachers, readings for students (grades 8-10); Readings for students (grades 5-9); and readings for students (grades K-6). Included in four appendices are guides for films and audio-visual materials, curriculum materials, sources of information, and government documents. (Author/CP)

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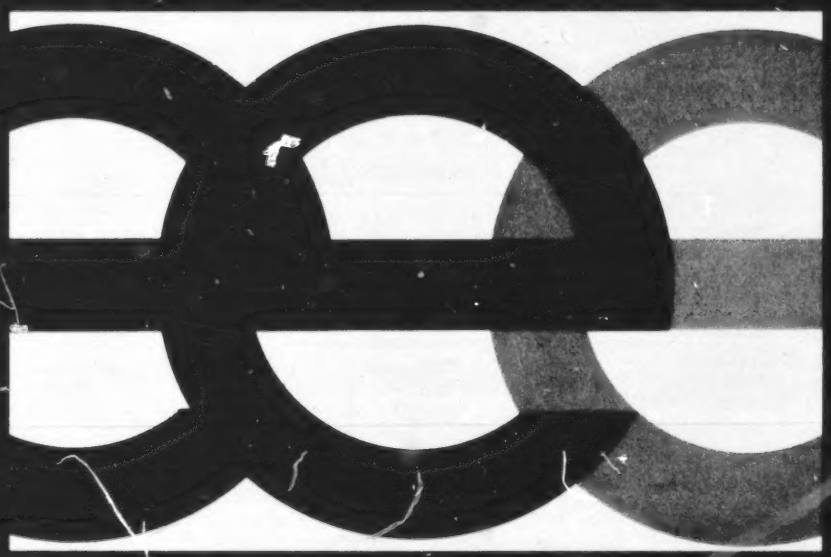

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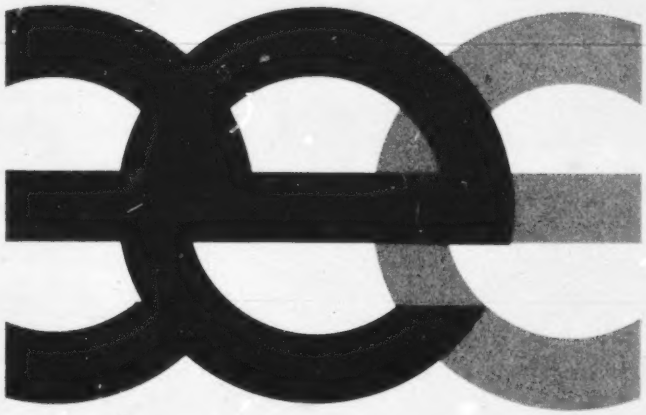

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ENERGY-ENVIRONMENT MATERIALS GUIDE

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Preface

The readings collected and annotated here represent only a sampling of the current energy literature. In selecting references we looked for those books and articles which, in our opinion, are interesting, informative, and likely to be available in your school or public library.

We have divided the references into four separate bibliographies, each directed to a specific audience: Readings for Teachers; Readings for Students (grades 8-12); Readings for Students (grades 5-9), and Readings for Students (grades K-6). There is, however, a great deal of overlap between these listings; teachers may well find references for their own use on the student bibliographies and students, depending on their reading level, may well find suitable references on the teacher or other grade level lists.

Each bibliography is divided into the following sections:

I Basic General References
II Energy Fundamentals (Basic Science Topics)
III Energy Resources (Fossil and Nuclear Fuels)
IV Electric Power
V Energy Into Power (Conversion Mechanics & Machines)
VI Supply and Demand (Fuel Supplies vs. Consumption)
VII Nuclear Power
VIII Environmental Effects (Air Pollution, Thermal Pollution, Land Reclamation, etc.)
IX Future Energy Sources (Solar, Geothermal, Fuel Cells, etc.)
X Energy Conservation
XI Energy Policy (Economics, Politics & Social Implications)

Additional materials are provided in the four appendices. Appendix A, "A Guide to Films and Audio/Visual Materials," is a listing, by topic and grade level, of approximately 80 energy-related films, filmstrips, and cassettes suitable for classroom use. Appendix B, "A Guide to Energy-Environment Curriculum Materials," lists by state, the various kinds of teaching materials (activities, charts, graphs, and bibliographies) available for classroom use with specific grade levels. It also includes curriculum materials available from various organizations and commercial groups. Appendix C, "Sources of Information and Materials," lists private, public and commercial organizations which invite requests for materials on energy-environment topics. Some specific materials available from these groups are noted. "A Guide to Government Documents," Appendix D, gives directions for obtaining copies of government publications from bookstores, Congressional Committees, or Congressional representatives. Finally, "Keeping Current" provides a list of monthly and annual bibliographies as well as a list of subject terms that might prove useful in researching topics for student projects, etc.

In all some 300 books and articles are annotated in the bibliographies, many containing bibliographies or suggested reading lists of their own. It is our hope that somewhere in these bibliographies and materials appendices you will find a reference or group of references that will meet your information needs and those of your students.

KEM

January 1975

PART I
Readings for Teachers

ENERGY-ENVIRONMENT MATERIALS GUIDE

Part I

SUGGESTED READINGS FOR TEACHERS

An annotated bibliography of books and articles selected for the classroom teacher.

I Basic General References

1) Energy in the United States: Sources, Uses and Policy Issues, Hans H. Landsberg and Sam H. Schurr (New York: Random House) 1968 (242 pp.; $3.50; Nontechnical).

An excellent, nontechnical summary of the place of energy in the American economy, this analysis is derived from two earlier Resources for the Future reports: **Energy in the American Economy, 1850-1875** and **Resources in America's Future.** In a very readable text, accompanied by a good selection of tables and graphs, the authors provide an informative discussion of energy sources and sectors of consumption, changes in supply and demand over time, dimensions of future demand, conventional and new sources, the role of electricity, the outlook for adequacy, and the implications of a variety of public policy issues. Written in the mid-sixties, however, it misses some of the urgency of the related environmental issues and the drama of the oil embargo.

2) Energy: The New Era, S. David Freeman (New York: Random House) 1974 (386 pp.; $2.45; Nontechnical).

Sponsored by a grant from the Twentieth Century Fund, this analysis of contemporary energy issues by the man who directed the Ford Foundation Energy Policy Project provides a clear and incisive guide to the intricacies of America's energy problems. Freeman takes a hard look, not only at the basic energy issues, but at the more subtle matters of America's affluence and the life styles of her people. The origins of the "energy crisis," the enormous demands made on a limited energy supply, the impact of energy consumption and production on the environment, the politics of energy, and the opportunities for conservation and for the development of new energy sources, all come under Freeman's scrutiny as elements crucial to the understanding of America's energy future.

3) "The Energy Crisis: Reality or Myth," Robert M. Lawrence and Norman I. Weingert, Editors, **The Annals of the American Academy of Political and Social Science** (Philadelphia: The American Academy of Political and Social Science) 1973 (167 pp.; $3.50; Nontechnical).

Contributions from some of the best-known writers on the energy question are represented in this collection of essays, all of them extremely well written and each directed to a major issue in the current energy debate. An overview paper by S. David Freeman introduces this special issue of the **Annals** and the 13 essays that follow provide examination of everything from the promise of nuclear energy, the future of coal, and the potential of solar energy to an examination by Rogers C.B. Morton of the Nixon energy policy, an analysis of electric utilities and state regulation agencies, and a good, brief overview of the major policy issues facing the United States. Of particular interest are two companion essays: Kenneth Boulding's "The Economics of Energy" and Bruce Hannon's "An Energy Standard of Value."

4) Energy, Ecology and the Environment, Richard Wilson and William J. Jones (New York: Academic Press) 1974 (353 pp.; $5.95; Semi-technical).

Essentially an undergraduate text aimed at the nonscience student, this is a book which deals both with fundamental science methodology and with the broader issues of the energy-environment dilemma. Topics treated include energy resources, energy demand and cost, thermal pollution, nuclear fission and fusion, cost-benefit economics, energy converters, waste disposal, and regulation of the energy industry. Numerous tables and graphs are included with the text, along with an extensive collection of "technical notes" (explaining such concepts as doubling times) and a technical appendix. The science teacher, in particular, should find this a valuable reference.

5) Energy and the Environment, John M. Fowler (New York: McGraw Hill) 1974 (To be published April 1975; Semi-technical).

Like the Wilson/Jones book, this is a discussion of energy from the perspective of science. The social science influence is much stronger here, however, and Fowler's book provides a balanced treatment of energy fundamentals and policy issues, with particularly close and detailed attention to such environmental effects as air pollution, thermal pollution, and the hazards of nuclear power. As much a reader as a textbook, most of the technical material has been relegated to the appendices, and the text very much reflects Fowler's long-time involvement as a science spokesman for the environmental movement.

6) Energy: Sources, Use, and Role in Human Affairs, Carol and John Steinhart (Belmont, California: Wadsworth Publishing Co.) 1974 (362 pp.; $6.50; Nontechnical).

This is a text specifically directed to students of social science. While some basic science content is included, the focus is very much on the historic and social implications of energy. The discussion centers around three main topics: Energy in Nature and History (forms of energy, energy budget of the earth, efficiency, etc.); Energy Resources and Their Use (fossil fuels, nuclear energy, electricity, future sources); and Prospects for the Future (demand and end uses, climate modification, policy, and predictions of world consumption). The attempt to summarize and simplify so much complex material has led to some problems in the pedagogy here, but much of the text is very interesting to read and the historical perspective, in particular, provides some fascinating material.

7) Energy: A Crisis in Power, John Holdren and Philip Herrera (San Francisco: Sierra Club Books) 1971 (252 pp.; $2.75; Popular).

This is really two books in one: a textbook on energy fundamentals and a handbook for environmental activists. In part one, "Energy: Resources and Consumption," Holdren provides a good, short review of the basic facts about energy sources, uses, and patterns of consumption. In part two, "Power: Conflicts and Resolutions," Herrera provides a fascinating account of some of the recent controversies over the siting and operation of eight nuclear power plants. It is in this latter section that the Sierra Club's commitment to citizen participation in environmental issues comes through most strongly and the effect is to both stimulate and inform, a combination that makes for good and useful reading.

8) Environmental Quality, the Fourth Annual Report of the Council on Environmental Quality (Washington: USGPO) 1973 (499 pp.; $4.30; Nontechnical).

Energy is but one aspect of the environmental mosaic examined in this report which reviews the national progress being made in correcting a variety of environmental abuses. It is useful to see an overview of the priority given to various environmental problems and to see the energy-related issues couched in the perspective of the entire environmental quality problem. The text is consistently readable, with a good collection of background data displayed in graphs and tables, making this an excellent source of information on the status of government efforts to curtail the environmental effects of energy production and consumption.

9) "Energy & Power," **Scientific American 224** (3), September 1971. A special, single-topic issue also available as **Energy & Power,** A Scientific American Book (San Francisco: W.H. Freeman) 1971 (144 pp.; $3.25; Nontechnical).

There are 11 articles in this single-theme issue, ranging from a discussion of the role of energy in human life through a review of energy resources, photosynthesis, the flow of energy in hunting, agricultural, and industrial societies, an analysis of energy and information, and a consideration of decision-making in the production of power. Excellent illustrative materials accompany the text and throughout the issue careful attention has been paid to provide a coherent, broad-based introduction to the role of energy in human society.

10) "Energy," **Science 184,** 19 April 1974. A special, single-topic issue (139 pp.; Semi-technical).

An impressive group of authors has combined to produce this overview of energy issues and the result is an excellent state-of-the-art summary of energy technology, policy, and economics, accompanied by a wide sampling of current data on all aspects of the energy debate. A good cross-section of opinion is represented under each of the five main headings: People and institutions: Impact of the Crisis; Policy; Economics; Oil, Coal, Gas and Uranium: The Developed Technology; and Sun and Earth: Developing Technology. The issue is introduced by an overview paper from H.H. Landsberg of Resources for the Future and a bibliography of relevant articles that have appeared in recent issues of **Science** is appended.

11) "The Energy Crisis," **Science & Public Affairs, Bulletin of the Atomic Scientists 27** (7-9) September, October, November 1971. A special, single-topic issue also available as **The Energy Crisis** from: Circulation Manager, Bulletin of the Atomic Scientists, 1020-1024 E. 58th Street, Chicago, Illinois 60637 (250 pp.; $2.95; Semi-technical).

This three-part discussion, comprising 26 articles on the energy crisis, provides both a comprehensive summary and an interesting mix of viewpoints on some of the more controversial aspects of the energy debate. Nuclear energy, its benefits and risks, is the central issue in a majority of these articles, but solid treatment is also provided of alternative power sources (in particular, solar energy as discussed by Meinel & Meinel) and of energy policy considerations. While this is certainly a more technical discussion than those in either the **Scientific American** or **Science** special issues, there is a wealth of detail here and, for the serious student, this should prove a most valuable and rewarding reference.

12) "Energy & the Environment," John M. Fowler, **The Science Teacher 39:** 10-22, December 1972 (Nontechnical).

Adapted from a Sunoco Science Seminar presentation at the 1972 convention of the National Science Teachers Association, this paper provides a very readable and useful condensation of the basic issues underlying the energy debate. Three main topics are addressed: Energy: Where it Comes From and Where it Goes; Environmental Effects of Energy Use; and Resources and New Sources. A good selection of tables and graphs is included and particular care has been taken to present the technical material in an interesting and intelligible manner.

13) Energy Facts, prepared for the Subcommittee on Energy of the Committee on Science and Astronautics, U.S. House of Representatives 93rd Congress, First Session, by the Science Policy Division, Congressional Research Division, Congressional Research Service, Library of Congress (Washington: USGPO) November 1973 (539 pp.; $3.65; Stock #5270-02160).

This is a handbook of U.S. and world energy statistics (obtained from the most recent, primary sources) displayed in easy-to-read tables and graphs. It is an extremely useful document, providing easy access to answers to some of the most frequently asked questions about energy. A good bibliography is included, along with a glossary of energy terms, a list of conversion factors, and a very well thought-out index. Anyone who has tried to make sense out of the many versions of energy statistics now in print will appreciate the service that this report provides.

14) Energy: Today's Choices, Tomorrow's Opportunities, Anton B. Schmalz (Washington: World Future Society) 1974 (301 pp.; $6.00).

Most of the essays here are quite short, but together they provide an interesting perspective on the theme of this volume, "new dimensions in thinking for energy policy." Topics covered include resources, technology, economics, humanities, policy implementation, and the evidences of change in patterns of energy consumption. Most of the essays are quite interesting, some are reprinted from journals like **Science,** and a few are accompanied by illustrations.

II Energy Fundamentals

1) The Concept of Energy Simply Explained, Morton Mott-Smith (New York: Dover Publications) 1964 (215 pp.; $1.50; Nontechnical).

This short Dover reprint provides an entertaining and informative discussion of heat energy, heat engines, and the First and Second Laws of Thermodynamics. The presentation is strongly historical and thus provides an unusual overview of such topics as the theory of heat, energy conservation, and entropy. A useful source book for students and teachers alike, it assumes very little in the way of science or mathematical background.

2) Energy: From Nature to Man, William C. Reynolds (New York: McGraw Hill) 1974 (276 pp.; $8.95; Semi-technical).

Developed for use in an undergraduate course on energy and energy technology, this text assumes a more sophisticated background than the Mott-Smith book, and can be difficult reading for anyone with a limited background in science and/or mathematics. There is, however, a very good discussion here of basic mechanics, heat, flow system energetics, chemical bonding, nuclear energy, and the energetics of the atmosphere. A brief technical appendix on "Unit Systems and Conversion Factors" is included.

3) Energy in Perspective, Jerry B. Marion (New York: Academic Press) 1974 (208 pp.; $4.95; Semi-technical).

The "Energy Crisis" serves as the focus for a brief, fairly generalized discussion of basic facts about energy. Separate chapters focus on work, energy and power, energy consumption, sources of energy, nuclear power, the effects of nuclear radiation, the environmental impact of energy, and the prospects for the future. Directed to a non-science, undergraduate audience, the quantitative material is kept to a minimum and tables and graphs are presented in easily readable formats.

4) Environment, Power and Society, Howard T. Odum (New York: John Wiley & Sons) 1971 (331 pp.; $5.95; Semi-technical).

This is a difficult, but rewarding book in which Odum attempts to deal with the structure and function of society from an energy perspective. Beginning with careful definitions of work, power, and energy, Odum goes on to explore a broad range of energy systems, from terrariums to the planet itself, from photosynthesis to religion. Throughout, Odum's analysis is a unique one, demonstrating an impressive range of knowledge across many disciplines. An excellent selection of data and examples accompany the text, combining to make this an extremely interesting and stimulating treatment of the role of energy and power in social systems.

5) "The Energy Cycle of the Earth," Abraham H. Oort, **Scientific American 223:** 54, September 1970 (Nontechnical).

Oort's primary concern here is with climatology, "the central function of the atmosphere and the oceans in redistributing the incoming solar energy and hence in determining the macroclimate of the earth." It is an interesting and informative summary of a topic that should be of interest to science students. As is usually the case with **Scientific American,** the graphics are excellent, several of them suitable for classroom display.

III Energy Resources

1) "Energy Resources," M. King Hubbert in **Resources & Man,** A Study and Recommendations by the Committee on Resources and Man, National Academy of Sciences (San Francisco: W.H. Freeman & Co.) 1969 (250 pp.; $2.95; Nontechnical).

Hubbert is one of the most quoted and productive authors of energy resource estimates and his emphasis here, as in most of his writings, is on the depletion of resources and the brevity of time, measured against man's history, during which the fossil fuels, in any abundance, will be available. The bulk of this chapter is given over to a careful estimation of U.S. and world reserves of oil, natural gas, and coal. Brief discussions of solar energy, water power, tidal power, and geothermal energy are also included, along with a fairly detailed analysis of the potential and problems associated with nuclear power. In the final section, "Human Affairs in Time Perspective," Hubbert draws some interesting conclusions about the social implications of our limited natural resources.

2) "Energy: The Saga of the Fossil Fuels," Brian J. Skinner, Chapter 7 in **Earth Resources** (Englewood Cliffs, New Jersey: Prentice Hall) 1968 (150 pp.; $2.75; Nontechnical).

This is one of the Foundations of Earth Science Series books and is an excellent companion volume to Hubbert's essay. It contains much useful detail as to the formation, composition, and geographic distribution of the fossil fuels, but does not provide the thorough estimation of resource reserves that Hubbert does. It covers the big three fuels, oil, coal, and natural gas, as well as tar sands and oil shale. Skinner also includes a brief discussion of nuclear energy, with data on uranium reserves of various grades of purity.

3) "Energy Resources of the United States," P.K. Theobold, S.P. Schweinfurth and D.C. Duncan, U.S. Geological Survey Circular #650 (Washington: USGPO) 1972 (27 pp.; Free on request from: U.S.

Geological Survey, Washington, D.C. 20242; Semi-technical).

This has quickly become a standard reference in the energy resources literature and despite its brevity provides a remarkably thorough overview of the nation's resources. Separate sections are directed to the examination of coal resources, uranium, geothermal, and oil shale resources. The text discussion is very clear and concise, the data are presented in easy-to-read tables and graphs and an extensive list of references is appended.

4) "U.S. Energy Resources: Limits and Future Outlook," Eric S. Cheney, **American Scientist 62,** January-February 1974 (Nontechnical).

This is an excellent, brief summary of the current status of world energy reserves and of their projected lifetimes under existing patterns of consumption. A particularly interesting account of the Alaskan North Slope petroleum reserves is provided, along with some useful insights into the economics of energy in the world market. Cheney ends with a quick summary of several potential energy conservation schemes and some brief remarks on the steady state economy or "zero per capita power growth" scenario.

5) "Our Energy Supply and Its Future," **Battelle Research Outlook 4** (1), 1972 (41 pp.; Available from: Battelle Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201; Nontechnical).

Several issues of the **Outlook** have focused on one or another aspect of the energy problem, providing brief, nontechnical summaries designed to demonstrate the application of research to significant current problems. Articles in this issue are addressed to questions of energy supply statistics, the transmission of energy, ways to reduce consumption, the promise of unconventional resources, the potential of nuclear energy, and "New Frontiers in Energy Storage." All of the papers are readable and well illustrated.

6) "Oil Shale and the Energy Crisis," Gerald V. Dinneen and Glenn L. Cook, **Technology Review 76:** 26-33, January 1974 (Semi-technical).

Oil shale in the West is an immense potential resource of petroleum and one that has gained increasing prominence in recent months. There are serious uncertainties, however, associated with the mining of shale, some of them technological and some having to do with the environmental implications of shale mining. This article, prepared by two U.S. Bureau of Mines researchers, provides a very informative account of the role oil shale might play in the energy market of the future and the kinds of problems that mining shale might produce. Particular attention is focused on the Green River Formation in Colorado, one of the most promising sites for processing, and an account is given of what research on the potential of that shale has demonstrated. Problems of processing the shale on site are described, along with a brief summation of the potential environmental impact of the shale oil industry and of the economics of tapping this particular natural resource.

7) "The Energy Problem: Natural Gas," Shell Oil Company, August 1973 (30 pp.; Available from: Shell Oil Company, Public Affairs, P.O. Box 2463, Houston, Texas 77001; Popular).

This is one in a series of Shell Oil papers on various aspects of the energy situation. It is useful on several counts, combining a good, concise summary of the present role of natural gas with interesting projection figures. Excellent charts and graphs suitable for classroom display are included.

8) "How Much in Reserve?" F. Case Whittemore, **Environment 15** (7): 16-20+, September 1973.

A great deal of controversy has surrounded the various fuel reserve estimates put forward by government and industry. Arguing that we have in reserve "more fuel than meets the eye," Whittemore provides an extremely interesting and informative review of how various fuel estimates have been made and the economic externalities that have operated to keep estimates at a conservative level. Numerous diagrams and illustrations accompany the text.

9) "America's Energy Potential: A Summary and Explanation," Prepared by Congressman Morris K. Udall, Chairman, Subcommittee on the Environment, for use of the Committee on Interior and Insular Affairs, U.S. House of Representatives, 93rd Congress (Washington: USGPO) October 1973 (19 pp.; Available from the Committee on request).

Designed to provide "a summary picture of America's current energy position, complete with the kind of technological description that the layman can ... understand," this brief report provides a concise, extremely useful summary of our energy resources and the potential for their development. Separate sections are addressed to Oil and Gas, Coal, Nuclear Energy, Solar Energy, and Geothermal Energy, with resource estimates, cost information, and potential technological improvements for each discussed clearly and concisely. A brief "Notes on Energy Conservation" section concludes the report with short comments on energy conversion methods, energy consumption efficiency and conservation by reduced demand for goods and services.

IV Electric Power

1) The Environmental Impact of Electrical Power Generation: Nuclear and Fossil, A Minicourse For Secondary Schools and Adult Education, Prepared by the Pennsylvania Department of Education under contract to the U.S. Atomic Energy Commission (Washington: USGPO) 1973 (89 pp.; $1.25; U.S. AEC Report WASH 1261; Nontechnical).

Designed to describe the cost-benefit ratio of the various methods of generating electric power, this two-volume minicourse provides an excellent summation of the power/environment issues for students and teachers. Topics treated in the source book include: The Demand for Electrical Energy, Meeting the Demand, Nuclear Power Plants, Fossil Fueled Electrical Generat-

ing Stations, Biological Effects, Waste in the Production of Electric Power, Power Plant Site Considerations, and Energy Conservation. The accompanying **Teacher's Guide** (WASH Report 1262; 156 pp.; $1.70) provides for each unit within the source book, educational objectives, suggested activities, and other pertinent materials, including a comprehensive achievement test.

2) Energy, Electric Power and Man, Timothy J. Healy (San Francisco: Boyd and Fraser Publishing Co.) 1974 (350 pp.; Nontechnical).

Designed as an undergraduate text for non-science students, this discussion of the role of electricity in the current energy dilemma is well within the reading range of many high school students. A much needed book, it fills a gap in the literature on energy available to the general reader. Written in traditional textbook style, complete with problems at the end of chapters, it is nonetheless an interesting account and one that should interest the serious student. Chapter titles include: Man's Use of Electric Energy, Electrical Energy from Other Forms, Hydroelectric Power Plants, The Costs of Generating Electric Energy, Fossil Fuel Electric Power Plants, Atomic Fission Power Plants, Geothermal, Tidal, and Solar Power, Nuclear Fusion, Energy and the Automobile, and The Electric Power Industry. Healy's broad perspective provides an excellent summary of the impact of electric power on our energy well-being.

3) Energy and the Environment: Electric Power, Report Prepared by the Council on Environmental Quality (Washington: USGPO) August 1973 (58 pp.; $.85; Stock #4111-00019; Nontechnical).

The central focus of this report is on electric power and the environmental impact of the fossil-fueled and nuclear systems in use today. The authors also deal briefly with the related issues of energy demand growth, energy system efficiency, and the methodology of energy demand forecasting. There is a good sampling of graphic material, along with some useful documentation and a series of technical appendices.

4) Environmental Effects of Producing Electric Power, Hearings Before the Joint Committee on Atomic Energy, Congress of the United States, 91st Congress, First and Second Sessions (Washington: USGPO) 1970 (5677 pp.; $10.75; Order No. Y4.At7/2:E12/3/pts 1 & 2; Nontechnical).

These three volumes of hearings, taken together with the hearings background document, "Selected Materials on the Environmental Effects of Producing Electric Power (USGPO, August 1969), are frequently cited as the most valuable single-source reference on America's electric power problems. Like all the energy hearings, they combine a fascinating behind-the-scenes glimpse of energy politics with a valuable compilation of energy reports and testimony from leading experts. Although the testimony can become tedious and repetitious, there is a vast amount of information here and, used as a source book on electric power, this is a valuable reference.

5) "Electric Power and the Environment," A Report Sponsored by the Energy Policy Staff, Office of Science and Technology (Washington: USGPO) August 1970 (71 pp.; $.75; Order No. PREX 8.2:E12; Semi-technical).

Several aspects of the electric power controversy are dealt with in this brief report: Institutional Arrangements and Standard Setting Considerations; Transmission Lines and Utility Corridors; Acquisition of Plant Sites; R&D to Alleviate Problems of Power Plant Siting, and Considerations Affecting the Growth of Electricity Consumption. Much information is presented in straightforward, academic style.

6) The 1970 National Power Survey, Federal Power Commission (Washington: USGPO) December 1971 (1500 pp.; $19.50; Order No. FP1.2:P87/970/pts 1, 2, 3; Semi-technical).

This four-volume report contains a comprehensive data summary of projected electricity demand growth over the next 20 years. Changing power technology is briefly discussed and some attention is given to issues of resource use and to the impact on air, water, and land of increasing electric power production. Essentially, however, this is a source book reference, designed to provide answers to the basic questions of how much electric power will be produced over the next 20 years and how that production will match with projections for electric power demand.

7) Overcharge, Senator Lee Metcalf and Vic Reinemer (New York: David McKay Co., Inc.) 1967 (338 pp.; $5.95; Popular).

Though somewhat dated, this remains a popular critique of the pricing policies of the electric utilities. Subtitled, "How electric utilities exploit and mislead the public and what you can do about it," this is a classic, muckraking examination of the role of the investor-owned utilities in the American energy economy. Written in a very descriptive, journalistic style, it is a book which raises some important discussion questions and one that should serve as good material in any debate on the conduct of the electric power utilities.

8) The Electric Power Business, Edwin Vennard (New York: McGraw Hill) 1970 (314 pp.; $5.95; Popular)

Vennard has written extensively on various aspects of the electric power industry and here he provides a brief, extremely informative overview of the electric utility business as a whole. Designed to give the basic facts about the power business and the economic principles that govern it, this is directed to a popular audience and presented in a straightforward, interesting, understandable manner. It provides a good balance to the above Metcalf and Reinemer critique.

V Energy Into Power

1) "The Conversion of Energy," Claude M. Summers, **Scientific American 221** (3): 148-164, September 1971 (Nontechnical).

There are very few nontechnical discussions of energy conversion techniques in print and this one, part of the **Scientific American** special issue on energy and power, is by far the most comprehensive. It is concise, informative, well-illustrated, and provides an extremely intelligible discussion of efficiency: its importance, its computation and specific efficiencies of a broad array of mechanical devices.

2) "Energy Conversions and Environmental Pollution," Michael D. Henderson and R. Curtis Johnson, **The Science Teacher 39** (3), March 1972 (Nontechnical).

While these authors do not attempt to cover quite the amount of material as does Summers, there is a very good discussion in this article of the basic principles of thermodynamics, the kinds of environmental problems associated with energy conversion, the way efficiency of conversion is calculated, and ways in which the pollution problems associated with energy conversion are being controlled. An added bonus here is the inclusion of several student problems, along with an extensive list of references for further reading.

3) "Energy Sources and Conversion Techniques," Ralph Roberts, **American Scientist 61:** 66-74, January/February 1973 (Semi-technical).

A more technical account than Summers', this is addressed to the question: "What is our capability of meeting the energy needs of the future within the limitations of known energy resources and energy conversion technology?" Roberts gives a brief review of the status of the various energy resources and focuses the bulk of his article on energy conversion methods, providing a good, semi-technical summary of the efficiency potential of a variety of energy-converting devices.

4) Heat Engines, John T. Sandfort (New York: Doubleday & Company) 1962 (314 pp.; $1.45; Semi-technical).

Subtitled "Thermodynamics in Theory and Practice," this is one of the Science Study Series books published to provide students and the general public with good, basic, nontechnical discussions of fairly complex scientific topics. Separate chapters treat Primitive Heat Engines, Carnot and the Evolution of Steam Engines, Thermodynamic Theory, Heat Pumps, Heat Engine Cycles and Efficiencies, and the contributions made to modern heat theory by Kelvin and Clausius. Sandfort's focus on historical development makes this a very interesting account and, as the mathematics are kept to a minimum, one that should be of value to anyone with an interest in the evolution of our understanding of heat and heat engines.

5) Energy for Man: From Windmills to Nuclear Power, Hans Thirring (New York: Harper & Row) 1962 (409 pp.; $1.95; Semi-technical).

First published in 1958, this has become something of a classic in the energy literature. While much of the data is now out of date, the basic science remains accurate and Thirring's presentation is notable for the clear, concise way in which difficult concepts are made intelligible. A good introduction to such topics as power, energy and heat, heat engines, engines used in power production (steam, internal combustion, etc.) and nuclear energy is provided, although it is doubtful that the book's appeal is quite as wide as Thirring had hoped ("from secondary school boys to industrial managers"). It seems, in fact, most suited to the reader with, if not a science background, at least a strong interest in the mechanics of how things work.

VI Supply and Demand

1) U.S. Energy Outlook, A Summary Report of the National Petroleum Council (Washington: National Petroleum Council) December 1972 (134 pp.; Available from: National Petroleum Council, 1625 K Street, N.W., Washington, D.C. 20006; Nontechnical).

In 1970 the Secretary of the Interior requested the NPC, an official advisory board to him, "to project the energy outlook in the western hemisphere into the future as near to the end of the century as feasible, with particular reference to the evaluation of future trends and their implications for the U.S." The Council was also asked to indicate ranges of possible outcomes and to emphasize where federal policies and programs could effectively and appropriately contribute to the attainment of an optimum, long-term energy posture. This report represents the Council's response to that request, and it has quickly become a standard reference for students of energy supply/demand problems. Nontechnical, it deals directly with six topics: Energy Supply and Demand Balances; Findings — Domestic Energy Supplies; Foreign Oil and Gas Availability; Financial Effects; Energy Trends Beyond 1985, and Recommendations for a United States Energy Policy.

2) The Energy Crisis, Lawrence Rocks and Richard P. Runyon (New York: Crown Publishers) 1972 (189 pp.; $5.95; Popular).

Despite its shortcomings, this is an interesting popularization of the energy supply/demand dilemma. Totally issue-oriented, with only minimal attention to the complex history behind today's energy problems, it quickly captures the reader's attention and in broad outline provides an interesting summation of where we are now, how we got here, and what kinds of options we have for the future. There is a lot of information about specific fuels, oil, coal, natural gas, and the "eternal sources," such as solar and geothermal resources. A great many recommendations are made for ways to correct our current and future problems and there is plenty of material here to interest and inspire further, deeper exploration into today's energy problems.

3) The National Energy Outlook, Shell Oil Company, March 1973 (40 pp.; Available from: Shell Oil Company, Public Affairs, P.O. Box 2463, Houston, Texas 77001; Popular).

One of a series of Shell energy assessment papers, this brief survey of energy supply/demand problems provides a concise, nontechnical and well-illustrated

summary of the current energy outlook, the problems inherent in making projections, the potential effect of energy conservation, and suggested government measures that could ease the supply situation. The graphics are particularly good and many of the charts and graphs could easily be used in the classroom.

4) "Energy Consumption: Trends and Patterns," Joel Darmstadter, Appendix in **Energy, Economic Growth and the Environment,** Sam H. Schurr (Baltimore: Johns Hopkins Press) 1972 (232 pp.; $2.95; Nontechnical).

Designed as "an underpinning of basic information pertaining to the historic, present, and prospective role of energy in the U.S. economy and throughout the world," this Appendix to a Resources for the Future forum proceedings (Reviewed here as Reference XI-2) provides an excellent, single-source reference on the uses of energy throughout the world. Five major topics are covered: long-term and recent trends in U.S. energy consumption; projected growth of energy in the U.S. over the next 30 years; the future, worldwide outlook for energy, and a brief discussion of some of the environmental aspects of the growth in U.S. and worldwide energy demand.

5) "The Facts About World Energy Needs and Resources," Nathaniel B. Guyol, **Center Report 6:** 5-9, December 1973 (Nontechnical).

Prepared as a background paper for the Center's Conference on World Energy Policy, this brief survey of the current world energy supply/demand picture provides an excellent introduction to this topic for the general reader. Guyol, one of this country's leading geographers and economists, reports in clear, nontechnical language his findings as to the efficiency of our energy use, our dependency on the various fuels, where the fossil fuel resources are located, and how they can best be made available to the world energy market.

6) "Energy," John Harte and Robert H. Socolow, Chapter 17 (pp. 276-294) in **Patient Earth** (New York: Holt, Rinehart & Winston) 1972 (364 pp.; $7.95/4.95 pa; Nontechnical).

This is an interesting text throughout, but the chapter on energy provides an especially good summary of the realities, in numbers, of the energy supply/demand dilemma. Intended as an undergraduate reader, there is a fair amount of data here, along with a careful introductory section in which the authors review some energy fundamentals: solar energy and the earth's heat balance, energy in the biosphere and cycles in the atmosphere. The focus of the chapter is on energy consumption vs. supply statistics and the kinds of environmental impact which will accompany our rapidly increasing energy appetite.

7) Understanding the National Energy Dilemma, A Report of the Joint Committee on Atomic Energy (Washington: The Center for Strategic and International Studies) 1973 (Available from: The Center for Strategic and International Studies, Georgetown University, 1800 K Street, N.W., Washington, D.C. 20006).

This is essentially a visual display of the energy supply and demand picture and consists of 16 graphic "fold-outs." The first five of these are energy flow charts showing the sources and end uses of energy in 1950, 1960, 1970 and projected to 1980 and 1990. These also show the amount of energy, in barrels of oil equivalent per day, used in the various end-use categories (residential and commercial, industrial, transportation, and non-energy) and the amount of energy wasted in each category. Eleven so-called "crass plots" give the growth with time of such dimensions as end use, efficiency, supply and demand, etc. The last of the fold-outs can be used to assess supply, demand and shortages. Brief, but clear instructions for the interpretation of these fold-outs accompanies them and the whole package would be useful to a classroom teacher who wishes to present the energy picture in graphic form.

8) United States Energy Through the Year 2000, Walter G. Dupree, Jr. and James A. West, U.S. Department of the Interior (Washington: USGPO) December 1972 (66 pp.; Stock #2500-00775; $0.95).

The results of comprehensive studies and analyses of probable future energy consumption within each of the energy consuming sections and for each of the energy supply sources are presented. Very little text description accompanies numerous graphs, charts, and tables, many of which should be useful to illustrate classroom discussions.

9) "Patterns of Energy Consumption in the United States," Office of Science and Technology (Washington: USGPO) January 1972 (220 pp.; $2.25; Stock #4106-0034; Semi-technical).

Although now somewhat dated, this OST report provides a thorough analysis of energy consumption in the past decade. Significant uses for the various fuels are delineated, along with breakdowns as to which fuels are used for the various end uses. The rate of growth of consumption in the major end uses of each fuel is discussed and the technical efficiencies of the various fuels are noted in a discussion of the suitable matching of fuels to end uses. Written on a semi-technical level, the report is rich in graphs, tables, and flow diagrams and provides concise answers to questions of how we use our fuels and how well we have matched fuels to end uses.

VII Nuclear Power

1) Man and Atom, Glenn T. Seaborg and William R. Corliss (New York: E.P. Dutton & Co., Inc.), 1971 (411 pp.; $10.00; Popular).

Subtitled "Building a New World Through Nuclear Technology," this is an enthusiastic account of how the peaceful use of atomic energy may solve many of our current problems, particularly the need for energy in a world of increasing population and decreasing natural resources. A wide variety of potential nuclear applications are explored, ranging from climate and agricultural applications to nuclear excavation, interplanetary shuttles, and radiation therapy. The last section of the book,

"The Atom and Society," provides a good discussion of the role of the AEC in nuclear affairs, of nuclear economics, and of the prospects for worldwide atomic power. All in all, an interesting account that provides an optimistic rejoinder to the nuclear power critics.

2) The Careless Atom, Sheldon Novick (Boston: Houghton-Mifflin & Co.) 1969 (225 pp.; $5.95; Popular).

This is an examination of the other side of the nuclear coin, an assessment of nuclear hazards, real and potential, written by the editor of **Environment** magazine. While there is some weakness in the treatment of basic science content, the discussions of the complex problems that have beset the nation's attempts to put atomic power to work are excellent. Descriptions from records of government hearings, technical reports, and public speeches have been carefully woven into the text, providing impressive documentation for Novick's warnings about the perils of nuclear energy. There are fascinating sections on nuclear accidents and hazards from leaks and earthquakes along with an informative discussion of radiation damage and the whole rationale of the policy decision to push nuclear development at the expense of research into fossil fuel technology. In short, this is a very good companion to the Seaborg/Corliss book and the two books together provide a wealth of material for nuclear energy debate.

3) The Nuclear Controversy, Ralph E. Lapp (Greenwich, Connecticut: Fact Systems) 1974 (93 pp.; available from: Fact Systems, 537 Steamboat Road, Greenwich, Connecticut 06830; Nontechnical).

Lapp examines eight key issues in this primer on the nuclear energy controversy designed for use by power company executives: Adequacy of Uranium Resources as Fuel for the Future, Routine Releases from Nuclear Power Plants, Abnormal Occurrences in Reactor Operation, Emergency Core Cooking and Reactor Safety, Major Nuclear Accidents, Transportation Risks, Nuclear Safeguards, and Radioactive Waste Disposal. A brief review of the "Fundamentals of Nuclear Power" introduces the discussion and a glossary is appended.

4) "Nuclear Power Risks," R. Philip Hammond, **American Scientist 62:** 155-160, March/April 1974 (Nontechnical).

Written in rebuttal to the nuclear critics, this brief article by a leading nuclear scientist provides a thoughtful look at some of the hazards involved in the operation of nuclear reactors. Hammond's message is a reassuring one, reminding us of the extraordinary safety measures that have been built into the nuclear reactor development program and providing an assessment of nuclear hazards in the context of the hazards associated with mining and burning fossil fuels.

5) "Fast Breeder Reactors," Glenn T. Seaborg, **Scientific American 223:** 13-21, November 1970 (Semi-technical).

Everything you always wanted to know about the operation of breeder reactors is here — from the kinds of reactors now under development, to "blanket criteria," the role of the coolant, the function of the control rods, and the types of container design now under consideration. There is some attention given to matters of safety, cost, and environmental impact, but for the most part this is a clear, concise, semi-technical description of what a breeder reactor is and how it works.

6) Fast Breeder Reactors, Thomas B. Cochran (Baltimore: Johns Hopkins Press) 1974 (271 pp.; $6.95; Semi-technical).

Subtitled "An Environmental and Economic Critique," this Resources for the Future monograph provides a detailed analysis of breeder reactor costs, both in terms of dollars and of potential hazards to the environment. Separate chapters in Part I are addressed to such economic issues as development expenditures, generating costs, uranium supplies, and the economies of electric power. In Part II, the focus is on environmental factors, with particular attention to the problems of residuals and the safety aspects of both reactors and their support facilities. Although this is at times a difficult book, it is a good companion to the Seaborg article and, together, these two references provide an excellent introduction to the questions at issue in the breeder reactor debate.

7) Nuclear Power Plants, Ray L. Lyerly and Walter Mitchell, III, U.S. Atomic Energy Commission, Office of Information Service, 1967 (54 pp.; Popular; Available from: USERDA, P.O. Box 62, Oak Ridge, Tennessee 37830).

One in a series of "World of the Atom" booklets published by the AEC, this is an excellent, quick primer on the kinds of reactors (Boiling Water, Pressurized Water, Gas Cooled, Heavy Water, and Breeder), typical power plant design features, the cost of nuclear power, and existing nuclear power plants in the U.S. and abroad. Helpful illustrations accompany the text, including a good selection of photographs of the various plants now in operation. A list of references to other nontechnical materials is included, along with a guide to available AEC films.

8) The Nuclear Power Rebellion: Citizens Vs. the Industrial Establishment, Richard S. Lewis (New York: The Viking Press) 1972 (313 pp.; $8.95; Popular).

Relying heavily on the public record in hearings, government reports, and newspaper accounts, Lewis has assembled a journalistic account of what private citizens have done to thwart the AEC's efforts to secure sites for nuclear power plants. Strongly critical of the AEC, Lewis recounts numerous episodes of conflict and carelessness in the AEC's history and focuses particular attention on the AEC's dual role as promoter and regulator of nuclear power development. Reading this is a good, quick way to become familiar with the politics of nuclear energy, with the zeal of nuclear critics, and with the kinds of hazards that exist and cause citizen rebellion when a nuclear power plant is proposed for the neighborhood.

9) Nuclear Theft: Risks and Safeguards, Mason Willrich and Theodore B. Taylor, A Report to the Energy Policy Project of the Ford Foundation (Cambridge: Ballinger Publishing Co.) 1974 (252 pp.; $4.95; Nontechnical).

This is the first thorough examination of what has been up to now little more than a good theme for James Bond movies. In reality, the prospect of nuclear theft, of an individual or government getting hold of bomb-grade nuclear material, is one which becomes increasingly possible with the advent of the breeder reactor. It is a sensitive and difficult question and one which is just now emerging into the public domain having been relegated up to now to governmnent secrecy. Whatever judgments are made about the analysis and conclusions noted here, this is an extremely important issue and this book should be widely read and discussed.

VIII Environmental Effects

1) Power Generation and Environmental Change, David A. Berkowitz, Editor (Cambridge: MIT Press) 1971 (440 pp.; $16.95; Semi-technical).

The 23 papers that comprise this volume are directed to the effects that power generation technology has had on the land, the water, the air, and the atmosphere. Potential means for abating and/or controlling the environmental effects associated with power generation are reviewed and suggestions for more environmentally compatible methodologies are offered. Brief bibliographies and summary sections conclude each paper. While some of the selections are fairly technical, others are quite intelligible to the general reader and provide an excellent state-of-the-art summation of power generation technology and its impact on the environment.

2) "Energy Products," Chapter 7 (pp. 288-306) in **Man's Impact on the Global Environment,** Report of the Study of Critical Environmental Problems (SCEP), Sponsored by the Massachusetts Institute of Technology (Cambridge: MIT) 1970 (319 pp.; $2.95 pa.; Semi-technical).

Important energy-related environmental effects are discussed throughout this report, but the "Energy Products" chapter provides an especially useful analysis, complete with sophisticated data, of energy-related wastes and emissions. Excellent documentation is provided and the reader interested in exploring the topic more deeply will find many good leads. Some interesting basic information on energy in the atmosphere, thermal waste, and energy consumption is provided in earlier chapters.

3) "The Price of Power," **Economic Priorities Report 3:** (2), May/June 1972 (Published bimonthly by the Council on Economic Priorities, 456 Greenwich Street, New York, New York 10013; Nontechnical).

Excerpted from the report of a year-long study of the electric utilities industry, this 55-page summary provides a wealth of information on the 15 utilities which together generate about 25 percent of electric power produced in the United States. The adequacy of pollution control at the various plants operated by these companies is evaluated and special attention is focused on the quality and quantity of emissions, radioactivity leaks, and thermal effects. Alternative power sources, hydroelectric power, and pumped storage are briefly discussed and a good discussion of energy R&D needs is provided in terms of what could be done to make cleaner power. An extremely interesting analysis of the advertising operations and growth patterns of the utilities is also included, along with a detailed second look at some of the more controversial power plants. All of this is presented in descriptive, journalistic style, with an emphasis on qualitative rather than quantitative argument.

4) Environmental Pollution, Laurent Hodges (New York: Holt, Rinehart & Winston) 1973 (370 pp.; $7.95; Nontechnical).

Despite the breadth of topic-coverage, this undergraduate reader in environmental pollution provides a surprisingly detailed discussion of the problems associated with power generation. Hodges' emphasis is on the physical and chemical principles underlying pollution problems, but he also manages to include a good summary of the societal problems arising from power generation and use. Chapters especially appropriate to the energy issue include those on Thermal Pollution, Radiation, and Electric Power Generation, but there is also much useful information in the chapters on Air Pollution, Water Pollution, and Solid Wastes. All are extremely readable and informative, with good documentation and graphics.

5) "Oil and the Environment: The Prospect," Shell Oil Company, 1973 (30 pp.; Available from: Shell Oil Company, Public Affairs, P.O. Box 2463, Houston, Texas 77001; Popular).

Another in the series of Shell papers on various aspects of the current energy situation, this brief report provides a good, well-illustrated discussion of the various kinds of air pollution and of the specific pollution problems associated with the actual production of petroleum. It is a very optimistic analysis of the problem and reports on the many devices and procedures the industry has developed and is employing in an effort to control pollution.

6) Oil Spill, Wesley Marx (San Francisco: Sierra Club) 1971 (139 pp.; $2.75; Popular).

One of the Sierra Club Battlebooks on environmental topics, this is a good, popular-level discussion of how and why oil spills occur, the ecological impact of spilt oil, the vulnerability of supertankers, and the hazards of coastal refineries. Marx is particularly concerned here with the shortcomings of our "cleanup" technology, and provides an interesting analysis of what is wrong with existing systems and what could be done to provide a more efficient response to oil spills.

7) Fundamentals of Air Pollution, Samuel J. Williamson (Reading, Massachusetts: Addison Wesley) 1973 (472 pp.; $14.95; Semi-technical).

There are a good many books on air pollution currently in print, but this one provides a particularly informative discussion of its physical causes and effects. Interdisciplinary in approach, it provides coverage on everything from meteorological aspects of air pollution to the social and political arrangements that impact on the problem. While this will no doubt be an especially valuable resource for the science teacher, it should also be stimulating reading for anyone interested in the basic facts about one of the major energy-related problems we now face.

8) Air Pollution, Virginia Brodine (New York: Harcourt, Brace & Jovanovich) 1973 (200 pp.; $3.95; Nontechnical).

This is an excellent nontechnical discussion of air pollution, written by a long-time associate of **Environment** magazine. Clear, concise, and extremely readable, it provides a good general discussion of what air pollution is and where it comes from, along with an interesting discussion of the magnitude of the environmental impact of air pollutants. Illustrated by fascinating accounts of some of the major air pollution incidents that have occurred, this is a good source of background information for students and teachers alike.

9) Night Comes to the Cumberlands, Harry M. Caudill (Boston: Little Brown & Co.) 1962 (394 pp.; $2.45; Popular).

Subtitled "a biography of a depressed area," this is the story of what the discovery of coal and the growth of the coal industry have done to the land and people of the Cumberland Plateau. Beginning with the settlement of the area in the mid-1700s, Caudill traces the history of the Plateau through the division and family feuds of the Civil War, the coming of the railroad and growth of the lumber and coal industries, the "Big Boom" and the depression that followed, the emergence of the unions, the "Rise of the Welfare State" and the scene today, complete with a thorough discussion of the complexities of the strip-mining controversy. This is an emotional book, with its emphasis on the destruction of the spirit of the "highlander," the descendents of the settlers who first opened the way into the mountains of Kentucky. Caudill's approach, to set the "price" in people and land against the cost of our increasing appetite for coal, makes for a most impressive account.

10) Stripping, John F. Stacks (San Francisco: Sierra Club) 1972 (140 pp.; $2.75; Popular).

Another of the Sierra Club Battlebooks, this is a critique of strip mining written by a **Time** magazine journalist. Stacks looks first at the machines, "Big Muskie" and the "Gem of Egypt," which have enabled the strip miners to be so productive. He then examines the environmental impact of strip mining, providing a moving description of what has happened to the mountains, streams, and homesites of Appalachia. Stacks' perspective is a humanistic one and he provides an impressive account of the impact of strip mining on both the land and its inhabitants.

IX Future Energy Sources

1) Energy and the Future, Allen L. Hammond, William D. Metz, and Thomas H. Maugh II (Washington: American Association for the Advancement of Science) 1973 (184 pp.; $3.95; Nontechnical).

Working from the thesis that this country cannot afford to be without more energy options, the authors of this AAAS book provide an extremely useful analysis of the technologies and research developments that promise to factor heavily in our energy future. There are separate sections on Energy from Fossil Fuels (gasification, power gas, MHD, etc.), Nuclear Energy (fission, breeder reactors), Alternative Energy Sources (geothermal, solar, photovoltaic cells, laser fusion), and Energy Conservation. All three authors have been associated with **Science** magazine for some time and the writing in this volume is, like that in **Science,** clear, concise, well-documented, and illustrated with plenty of tables and graphs. The result is a very interesting, nontechnical summary of future developments in the production, transmission, and conservation of energy.

2) New Energy Technology: Some Facts & Assessments, H.C. Hottel and J.B. Howard (Cambridge: MIT Press) 1971 (364 pp.; $2.95; Semi-technical).

This, too, is a book that focuses on the technological status of energy and fuel conservation processes, but it is quite a bit more comprehensive than the AAAS book and also more detailed and technical. The adequacy of a wide array of energy generating, conversion, and transmission processes is analyzed and specific areas where future research might prove profitable are isolated for discussion. Definitely directed to an audience with some science background, this is a complex but valuable book which provides an excellent summary of where we are now in terms of energy technology and where we should be aiming for the future.

3) "An Agenda for Energy," Hoyt C. Hottel and Jack B. Howard, **Technology Review 74:** 38-48, January 1972 (Nontechnical).

This is a brief, nontechnical summary of the MIT study reported in the Hottel book reviewed above. It is organized around the same theme: "Our objective is to assess the technical and economic adequacy of existing or proposed processes and their consistency with developing standards of environmental quality and to suggest where additional effort — research, development, and demonstration plants — is most needed to accelerate change." A brief review of the energy supply-demand situation is provided in the opening section of the paper, followed by a review of energy technology in a number of areas: sulfur pollution, thermal pollution, energy storage, fossil fuel-to-fuel conversions, and solar energy.

4) "Clean Power from Dirty Fuels," Arthur M. Squires, **Scientific American 227:** 26-35, October 1972 (Nontechnical).

Gasification of fossil fuels is a developing technology getting increasing attention as one solution to the

pollution problems associated with the oil and coal combustion. This is a particularly good, nontechnical account of what such a procedure might involve and how it would improve the efficiency and cleanliness with which fossil fuels are burned. A brief history of the evolution of various gasification schemes is provided and several of the experimental procedures now being tested here and in Europe are described.

5) "The Hydrogen Economy," Derek P. Gregory, **Scientific American 228:** 13-21, January 1973 (Nontechnical).

One of the more intriguing schemes for meeting the energy demands of the future is the so-called "hydrogen economy," a plan whereby all energy sources would be used to produce hydrogen, which could then be distributed as a non-polluting, multipurpose fuel. This is a fascinating summary of the challenges and promise of hydrogen as the universal fuel and it includes a thorough description of the technology which would be required, along with an informative discussion of the special properties of hydrogen which have caught the attention of Gregory and others.

6) "Controlled Nuclear Fusion," Samuel Glasstone, U.S. Atomic Energy Commission, Division of Technical Information, Oak Ridge, Tennessee (Oak Ridge: AEC) 1968 (50 pp.; Available from: USERDA, P.O. Box 62, Oak Ridge, Tennessee 37830; Nontechnical).

One in a series of AEC pamphlets on atomic energy, this provides a good, brief introduction to the technology and potential of fusion power. Separate sections discuss the importance of fusion energy, the conditions for nuclear fusion, self-sustaining fusion, plasma confinement by magnetic fields, stellerator systems, magnetic mirror systems, and the astron system. The status of fusion research in various countries around the world is reviewed. A good bibliography of nontechnical literature on fusion and a list of appropriate AEC films is provided.

7) Three articles on new energy technology in **The Science Teacher 39:** 36-51, March 1972 (Nontechnical).

Part of a special issue on energy, these articles, each dealing with a separate technology for the future, provide an extremely useful analysis of the prospects for solar power, geothermal power, and controlled fusion. "Solar Energy — Prospects for its Large Scale Use" by Peter Glaser, provides an examination of some of the characteristics of solar energy that have limited its large-scale use and discusses the idea of a satellite system which would help overcome some of the conversion inefficiencies incurred when attempts are made to harness solar energy from earth. "Geothermal Energy," by L.J.P. Muffler and D.E. White, is a very good discussion of the location of geothermal systems, uses of geothermal resources, types of geothermal systems, and the potential resource this type of power presents. In "Progress in Controlled Fusion Research," by P.L. Auer and R.N. Sudan, the conditions necessary for fusion are described and a fairly detailed description of the fusion reaction is given. Some of the various schemes currently under consideration are described and illustrated, with particular attention to the problems of plasma confinement. The authors conclude with an optimistic assessment of the chances of achieving fusion within the next decade.

8) "Prospects for Fusion Power," Richard F. Post, **Physics Today 26:** 30-42, April 1973 (Nontechnical).

An extended debate over the prospects of nuclear fusion has been carried in the technical journals for some time, but is rarely of interest to the general reader. The author of this article, however, has managed to provide a translation of that debate into nontechnical terms and to provide the general reader with a good, basic review of what fusion is and what problems have to be met before fusion power can be achieved. Very useful illustrations accompany Post's text and an extended list of references is included.

9) Direct Use of the Sun's Energy, Farington Daniels (New York: Ballantine Books) 1974 (271 pp.; $1.95; Nontechnical).

This is the book that the **Whole Earth Catalog** raved about as the best book on solar energy in print. Originally published in 1964, it provides both an enthusiastic review of the potential of solar energy and a call for additional research, particularly in the developing countries, into the prospects of large-scale solar energy utilization. Everything from solar cookers to home heating systems are described and an interested student could be directed to any number of projects and solar experiments illustrated here. In short, this is a fun and informative little book that should be of interest to students and teachers alike.

10) Solar Energy, Hans Rau (New York: The Macmillan Co.) 1964 (171 pp.; Nontechnical).

A revision of a 1959 German book, this is similar in format and scope to the Daniels book, but is slightly more technical and not nearly so well illustrated. Nonetheless, there is a good deal of useful information here and quite explicit directions for the design and building of a variety of solar energy mechanisms.

11) "Solar Energy," Arthur R. Tamplin, **Environment 15** (5): 16-20+, June 1973 (Popular).

Some extremely interesting solar energy schemes have been proposed in recent years, from solar farms and algal systems to orbiting solar space satellites, and all of them are briefly reviewed in this fascinating, well-illustrated article. Technical descriptions are kept to a minimum, with major focus on comparing the various systems as to cost, feasibility, and efficiency. Tamplin argues that with modest development several of these schemes could be made attractive, without requiring highly sophisticated technology.

12) "Geothermal Power," Joseph Barnea, **Scientific American 226:** 70-77, January 1972 (Nontechnical).

Barnea's theme in this article is that some of the pressure on world energy resources could be alleviated

through increased research on the exploration and development of geothermal power, a natural resource he views as a potential source of relatively cheap, clean, and multipurpose energy. Beginning with a brief recounting of the medicinal and recreation roles of "hot springs," Barnea explores several reasons for the slow development of geothermal power as an energy resource and argues that there are probably many more good geothermal areas than our present search techniques have identified. A number of existing geothermal operations are described and the variety of ways in which geothermal power is now being used are noted. A brief discussion of costs is included, along with a summary of some of the environmental effects associated with the production of geothermal power.

13) "Power from the Earth," David Fenner, **Environment 13:** 19-34, December 1971 (Popular).

An enthusiastic assessment of the potential for geothermal power, this brief article provides both state-of-the-art information as to the mechanics of tapping the earth's heat energy and the economics involved in getting that power out of the ground and into use. A particularly interesting survey of world geothermal resources is provided and Fenner provides an interesting commentary on the issue of nuclear stimulation of geothermal areas.

14) "Solar Sea Power," Clarence Zener, **Physics Today 26:** 48-53, January 1973 (Nontechnical).

Of all the schemes currently talked about for tapping solar energy, this is surely one of the most dramatic. What is proposed is that heat engines, operating in the tropical oceans, could capitalize on the temperature differential between the upper and lower levels, and could thus provide a source of economical and pollution-free electricity. A good description of what supporters of this idea have in mind, it is a very interesting topic for reading and discussion.

X Energy Conservation

1) Hidden Waste: Potentials for Energy Conservation, Edited by David B. Large (Washington: The Conservation Foundation) 1973 (137 pp.; $3.00; Nontechnical; Available from: The Conservation Foundation, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036).

Designed as a handbook for environmental activists, this compendium of factual material on various aspects of energy use and misuse provides an excellent introduction to what is known about ways to reduce wasted energy and resulting quantitative improvement. Topics dealt with include Homes (insulation, heating systems, air conditioning), Buildings (materials reclamation, beverage containers, trash as fuel), Transportation, Industry (processes and procedures), and Institutional Factors (Federal tax policies, economic vs. social costs). Introduced by a summary paper on U.S. energy use, a glossary of definitions and equivalents is included along with a good bibliography of recent references.

2) Citizens' Action Guide to Energy Conservation, Citizen's Advisory Committee on Environmental Quality (Washington: USGPO) 1973 (64 pp.; Stock #4000-00300; $1.75 single copy, discounts of 25 percent on orders of 100 or more copies; Popular).

This is really a dual purpose book, being both a source book on energy conservation and a handbook for citizen action. Most of the emphasis is on recommendations of ways to save energy in transportation, space heating, and industrial uses of energy. A particularly interesting section deals with the impact of energy on the American family and provides data on the supply, consumption, and energy budgeting of the typical American family. Early Federal policy regarding energy conservation is briefly reviewed and a final chapter examines the ways in which citizens can mobilize for energy conservation.

3) "The Potential for Energy Conservation: A Staff Study," Executive Office of the President, Office of Emergency Preparedness, (Washington: USGPO) October 1972 (192 pp.; $2.00; Stock #4102-00009; Semitechnical).

Although now somewhat dated, this is a fairly comprehensive report that contains a wealth of information, much of it displayed in easy-to-read tables and graphs, and provides detailed discussion of a broad spectrum of energy conservation measures. Separate chapters are directed to discussion of patterns of energy supply and demand, transportation efficiency, the use of energy in the residential and commercial sector, industrial energy use, electric utilities, the relationship between energy conservation and environmental pollution, potential fuel savings, and selected economic issues. A good bibliography is included, along with several useful appendices, one of which provides an index to current energy conservation programs. Clearly directed to a fairly sophisticated reading audience, this is an excellent source book on energy conservation data and strategies.

4) "The National Energy Problem: Potential Energy Savings," Shell Oil Company, October 1973 (28 pp.; Copies available on request from: Shell Oil Company, Public Affairs, P.O. Box 2463, Houston, Texas 77001; Popular).

This is a good source for energy conservation graphics (many of them suitable for classroom display) and for a brief, but informative overview of the areas of potential energy savings, ways and degree to which individuals can contribute to energy savings, and short-term and future projections of the quantitative impact of potential energy savings.

5) "How Shall We Conserve Energy?" **Technological Review 76,** February 1974 (Semitechnical).

There are four excellent articles in this issue, each addressed to a specific aspect of the potential for energy conservation. In "A Technical Basis for Energy Conservation," Charles Berg discusses the commodity nature of energy and examines the efficiency of various

energy conversion systems. The article by Bruce Hannon, "Options for Energy Conservation," provides an interesting analysis of how we use energy and the intensity with which we use it in terms of energy-labor input. Questions of packaging and marketing procedures are addressed in an article by R. Stephen Barry, with an emphasis on the concept of "thermodynamic thrift." Finally, Richard Rice provides analysis of energy use and misuse in the transportation sector.

6) "Conservation and Efficient Use of Energy," Joint Hearings before certain Subcommittees of the Committees on Government Operations and Science and Astronautics, House of Representatives, 93rd Congress, First Session, June 19, 1973 (Washington: USGPO) 1973 (four volumes; 1952 pages; approx. $3.00/volume; Stock #5270-02086; Nontechnical).

These four volumes of hearings provide a fascinating glimpse into the political arena where energy issues are debated and a valuable compendium of factual background, collected in testimony and the reprints of various reports. Representatives from industry, conservation groups, independent research organizations, and various government agencies all appeared to testify before these Committees, many of them submitting for the record good, brief summations of specific energy conservation questions. All these different viewpoints brought together in one place provides a good insight into the complexity of trying to change our energy habits. There is some excellent material here for student role-playing activities and good background information for an energy conservation debate.

7) "Energy Conservation," Hearings before the Subcommittee on Consumer Economics of the Joint Economic Committee, Congress of the U.S., 93rd Congress, First Session, November 19, 1973 (Washington: USGPO) 1973 (205 pp.; $1.60; Nontechnical).

Actually, the hearings section of this report is quite short, with good testimony from David Freeman, John Gibbons (Dept. of Interior, Office of Energy Conservation), and Robert Mosely, a senior economist with Shell Oil Company. What makes this a useful document, however, are the paper reprints, particularly two from Shell Oil's series on energy (The National Energy Outlook; The National Energy Problem: Potential Savings) and one put out by the National Petroleum Council titled "Emergency Preparedness for Interruption of Petroleum Imports to the United States."

8) The Contrasumers, A Citizens Guide to Resource Conservation, Albert J. Fritsch (New York: Praeger Publishers, Inc.) 1974 (182 pp.; $3.50; Popular).

The American standard of living comes under scrutiny here as evidence of a period of overconsumption which has led to shortages in our energy and materials resources. Fritsch, a founder of the Center for Science in the Public Interest, documents our consumption habits, compares them with those of people in other countries, and offers specific suggestions for conserving energy and materials on four levels — individual, community, national, and international. A Lifestyle Index (Part II, Section X-1) is appended, which enables readers to calculate their personal energy expenditures and compare them with the energy and materials consumed by people of other countries.

9) "Energy Conservation Through Effective Utilization," Charles A. Berg, **Science 181:** 128-138, July 13, 1973 (Nontechnical).

Based on the premise that "energy consumption could be reduced by improved efficiency of utilization in buildings and in industry" this article provides a discussion of present energy use in the United States, energy conservation by improved thermal performance of structures, heating and air conditioning systems, illumination in buildings, hot water heating, thermal effectiveness of industrial processes, and means to promote effective energy utilization. There is also a very informative analysis of the effectiveness with which fuels are currently being used, along with an examination of unused energy sources, such as solar energy and the conversion of trash to fuel.

10) 350 Ways to Save Energy (and Money) in Your Home and Car, Henry R. Spies, Seichi Konzo, Jean Calvin, and Wayne Thomas (New York: Crown Publishers) 1974 (193 pp.; $3.95; Popular).

This is a book which will pay for itself in no time. It is full of suggestions for ways to conserve energy in everything from home heating and cooling to large appliances and car driving. The writing is relaxed and at times humorous, with most of the suggestions easy to try and guaranteed to reduce the cost of running your home and your car. Very readable and well-illustrated, this is a book that you can't afford to not read.

XI Energy Policy

1) A Time to Choose, Final Report of the Energy Policy Project of the Ford Foundation (Cambridge: Ballinger Publishing Co.) 1974 (511 pp.; $3.95; Nontechnical).

The culmination of a two-year, four-million dollar inquiry into the nation's energy crisis, this report on the nation's energy choices provides a thorough review of tough, public policy questions along with a reasoned, well-documented exploration of ways to balance the energy budget, control pollution, and avoid reliance on foreign oil supplies. Most of the recommendations are directed toward trimming our energy growth, with specific attention to automobile, home, and factory consumption. The political power of the energy industries is examined, major aspects of the nuclear power debate, especially the breeder reactor question, are analyzed in detail, and environmental impact questions, such as those raised by strip mining, are discussed. In short, this is a thorough, timely critique of our current energy posture and its implications for the future.

2) Energy, Economic Growth and the Environment, Edited by Sam H. Schurr (Baltimore: Johns Hopkins Press) 1972 (232 pp.; $2.95; Nontechnical).

The list of contributors to this Resources for the Future forum reads like a Who's Who of

energy/environment spokesmen — Barry Commoner, Walter Heller, Philip Sporn, Glenn Seaborg, Kenneth Boulding, Joel Darmstadter, Edward Mason, Gordon MacDonald, and Richard Gonzalez. At issue is the dilemma presented by two of our national objectives: providing energy to meet the future needs of economic growth and protecting the quality of our environment. Issues of growth and its impact on the environment are addressed in the two opening papers, one by Heller and one by Commoner. Excellent summations of the impact of environmental standards on the availability and costs of electricity and petroleum are provided, along with careful analyses of public policy goals, the promise of new technology, and the potential for developing new goals for society. Appended to the report as background material is an excellent paper by Joel Darmstadter on "Energy Consumption: Trends and Patterns."

3) Energy and the Economy of Nations, W.G. Jensen (Cambridge, England: University Printing House) 1970 (165 pp.; $12.50; Nontechnical).

Quickly recognized as an important contribution to the literature, Jensen's analysis of the economics of world energy has become a standard reference for students of energy policy. Although the issues he addresses are complex and subtle, Jensen's presentation is clear and concise, providing an extremely readable and informative commentary on an extremely important aspect of energy policy.

4) Oil and World Power: A Geographical Interpretation, Peter R. Odell (Baltimore: Penguin Books) 1970 (188 pp.; $3.95; Nontechnical).

Like the Jensen book, this is an analysis written from an international perspective, but Odell's focus is on one component of the world energy market, oil. Although it predates the oil embargo and formation of OPEC, Odell's book provides a fascinating overview of the power politics which affects the buying and selling of oil on the world market. The scale of oil trading is briefly summarized and separate chapters focus on The United States and World Oil, Soviet Oil Development, The Major Oil Exporting Countries, Oil Policies in Western Europe, Japan as an importer of oil, the dependence on oil in the developing countries, and oil in international relations and world economic development.

5) "The Economy, Energy and the Environment," A background study prepared for the use of the Joint Economic Committee, Congress of the United States, September 1, 1970 (Washington: USGPO) 1970 (131 pp.; $.55; Nontechnical).

Prepared by the Environmental Policy Division of the Library of Congress, this background paper on energy in the American economy provides a very brief but useful summary of the major issues affecting energy-policy decisions. There are a good collection of data, a useful bibliography of related references, and very informative analyses of the role which each of the major fuels play in the American economy. Particular attention has been paid to the economics of the electric utilities industry and a good part of the report is directed to an examination of environmental considerations, particularly strip mining, thermal pollution, and air pollution.

6) "Energy Self-Sufficiency: An Economic Evaluation," **Technology Review 76,** May 1974 (Semi-technical).

Prepared by the Policy Study Group of the MIT Energy Laboratory this report is directed to an examination of "the responsiveness of today's complex energy system to those changes in the supply of fuels and in the demand for energy which are in fact possible by 1980 through present and foreseeable technology, and the effect on both of these changes on the prices of fuel and energy." Five "critical uncertainties" are isolated for examination: responsiveness of domestic supply and demand to price changes; world oil prices; the cost of synthetic fuels; expansion capacity of the construction industry, and the nature of national security. Several energy demand-supply forecasts are analyzed and estimates are made as to the supply of the major fuels: natural gas, domestic petroleum, coal, and nuclear power. The potential for synthetic fuels is briefly examined and a fairly detailed accounting of "The U.S. and the World Oil Market" is provided. A final section, "Policy Conclusions," provides discussion of four policy suggestions: seek revisions in current regulatory practice; allow the market to work at current international prices; correct adverse effects on income distribution, and provide security against import disruption.

7) "The Realities and Unrealities of Energy Economics," Mike Morrison, **Sierra Club Bulletin 58** (5): 10-4, May 1973 (Popular).

This is a highly descriptive, popularized primer on energy economics, written by a Washington journalist and designed to provide a readable introduction to the complex workings of energy economics. Morrison's primary focus is the oil industry and the kind of complicated pricing maneuvers which enable them to sell gasoline at cost and still make a profit. A lot of ancillary issues are touched on in the process and, while there is little in the way of documentation or factual argument here, Morrison's accounting of what goes on in the energy business is a fascinating and, at times, humorous one, which should provoke many questions and provide an excellent issue basis for a good debate of energy economics.

8) Energy Taxes and Subsidies, Gerard M. Brannon (Cambridge: Ballinger Publishing Co.) 1974 (177 pp.; $8.50/$2.95 pa; Semi-technical).

This is another in the series of reports to the Ford Foundation Energy Policy Project. Although the topic is complex and difficult, great care has been taken to provide a concise, lucid account that should serve to bring the facts of energy economics to the attention of interested citizens. No background in economics is assumed and, while it is difficult reading in some places, it does take away the mystery from an area of concern that has too long been the sole province of professional economists.

9) "The Gasoline Shortage: A National Perspective," A background paper prepared by the Congressional Research Service for use by the Committee on Interior and Insular Affairs, United States Senate (Washington: USGPO) 1973 (87 pp.; Serial No. 93-14; Available free from the Committee on request; Nontechnical).

The purpose of this report is to "identify the issues, to describe the impact of present public policy on gasoline supply and demand, and to suggest potential measures to reduce the shortfall." In so doing this report provides a good summary of the dimensions of our gasoline supply-demand situation and the impact of shortages on the consumer, on agriculture, and on independent marketers. There is a lot of good information on proposed remedial action, ranging from tax incentives through exploration and development of new fuels, to conservation of fuels through improved design in transit systems, buildings, and homes. All in all an interesting and valuable summation of the policies that have led to gasoline shortages, it also provides useful answers to many of the questions this difficult situation raised.

10) "Considerations in the Formulation of National Energy Policy," Prepared at the request of Henry M. Jackson, Chairman, Committee on Interior and Insular Affairs, U.S. Senate (Washington: USGPO) 1971 (115 pp.; Serial #92-4; Available from the Committee on request).

Prepared as a background document for the National Fuels and Energy Policy Study, this brief report provides a valuable classification and review of the kinds of questions needed to be addressed in the process of formulating a national energy policy. Major questions that bear on energy policy are grouped for consideration under four headings: economic, environmental, political, and technological. Support data are provided in tables and charts.

11) The Last Play, James Ridgeway (New York: E.P. Dutton & Co.) 1973 (446 pp.; $10.00; Popular).

Subtitled "The Struggle to Monopolize the World's Energy Resources," this two-part study of the world energy market provides a fascinating and extremely readable account of the complex economic and political questions that underlie the shaping of world energy policy. Part I, "Monopoly in Energy," provides an examination of the geographic distribution of energy resources and of the complex economic and political alliances that have resulted. Part II, "A Guide to the Energy Industry," provides a survey of the various components of the oil, natural gas, and uranium industries, along with an overview of transportation energy, U.S. electrical energy needs, future fuels, and the financial operations of energy companies.

PART II
Readings for Students
(Grades 8-12)

ENERGY-ENVIRONMENT MATERIALS GUIDE

Part II

SUGGESTED READINGS FOR STUDENTS: GRADES 8-12

An annotated bibliography of books and articles selected for students (Grades 8-12).

I Basic General References

1) The Conquest of Energy, George Russell Harrison (New York: Wm. Morrow & Co., Inc.) 1968 (297 pp.; $6.95).

Caught in the blackout of 1965 which briefly darkened much of the Northeast corridor, Harrison was sufficiently alarmed and impressed to undertake an investigation of our energy resources and of the supply-demand problems which would increasingly confront us. In this very readable and interesting account, he relates the story of the fossil fuels, how they were formed, how much of them is left, and how we have used them and will continue to use them in the future. The problems of converting fuel into power efficiently are discussed, and separate chapters are directed to the examination of "new" fuels especially nuclear power, solar energy, and geothermal power. A particularly interesting discussion of "animate energy," the biochemical processes that power life, is also included.

2) Energy in the World of the Future, Hal Hellman (New York: M. Evans & Co.) 1973 (240 pp.; $5.95).

Hellman, a prolific writer of popular-level science books, provides a comprehensive overview of how we use energy, along with a brief analysis of the effects of power production and consumption on the environment. Of particular interest are the final chapters in which Hellman examines the energy sources of the future: geothermal, solar, wind, water, and fusion. There is also a good discussion of the potential for energy conservation through improved storage techniques, more efficient modes of transportation, and the adoption of a conservation-based energy policy on a national scale.

3) Energy, Mitchell Wilson and the Editors of **Life** (New York: Time Inc.) 1963 (200 pp.; $9.00).

Alternating picture essays and brief text descriptions combine to make an extremely attractive and informative energy discussion. Fundamental definitions and basic science concepts are dealt with in the various chapters: The Prime Mover of the Universe; Getting Warm on the Trail of Heat; The Torrid Pace of Moving Molecules; Electricity: Willing Genie in a Wire; The Fantastic World of Dr. Einstein; Rich Dividends from Chemical Bonds (Oil), etc. Two appendices are included; one deals with energy reserves, the other provides a brief history of the development of atomic energy.

4) "Energy and the Environment," A Citizen's Workshop Handbook, U.S. Energy Research and Development Administration (Oak Ridge: Oak Ridge Associated Universities) Undated (31 pp.; Available from: Oak Ridge Associated Universities, Citizen's Workshops, P.O. Box 117, Oak Ridge, Tennessee 37830).

Part of the AEC's public information program, this short pamphlet was prepared to provide the general public with a concise summary of today's energy situation. It contains a good, brief statement of how much energy we use, a comparison of our rate of consumption to that in other parts of the world, and concise estimates of how much of the various fuels we have left. Short sections on environmental pollution, population, and conservation outline the basic concepts and energy-related problems in those areas, and a 10-question quiz over all these topics is included. The second half of the booklet is addressed to energy for the future, with brief discussions provided of direct conversion, energy from waste, oil shale and coal, geothermal, solar, and wind power and, of course, nuclear power. A short bibliography and glossary are appended.

5) Energy Crisis in America, Congressional Quarterly (Washington: Congressional Quarterly, Inc. (93 pp.; $4.00; Available from: Congressional Quarterly, Inc., 1735 K Street, N.W., Washington, D.C. 20006).

Each chapter in this special issue on energy originally appeared in the Congressional Quarterly **Weekly Report** or **Editorial Research Record.** While the reading level is fairly sophisticated, it is certainly within the range of many students and should provide them with an extremely informative, up-to-date and well-written account of the complexities of the energy crisis. Numerous charts, graphs and maps illustrate the text discussion, which ranges over everything from gasoline prices and the El Paso Gas Controversy to the AEC, Nuclear Power Options, New Sources of Energy, and a very useful review of federal energy legislation during the 1969 to 1972 period.

6) "America's Energy Crisis," **Newsweek:** 52-60, January 22, 1973.

The realities of the energy shortage are dramatically recounted in this feature article which examines the complexities of Arab-American relations, the wastefulness of U.S. energy consumption, the ways in which the government has encouraged consumption, and the alternatives available to us to meet the crisis. It is a good overview, with interesting photographs and two very useful charts, one depicting "Fuel Resources" and the other illustrating "America's Growing Appetite for Power."

7) "Energy Crisis," **Senior Scholastic 104:** 8-31, February 14, 1974.

Several aspects of the energy crisis are touched on in this special issue, including fossil fuel reserves, the politics of oil, future energy sources, patterns of consumption, and ways to conserve energy. While the coverage is far too brief to provide much detail, there are some useful tables and graphs included to help quantify the issues and the format is an attractive one which should generate student interest in reading more deeply into the literature on energy.

II Energy Fundamentals

1) Energy, Matter and Change, Ronald D. Townsend (New York: Scott Foresman and Company) 1973 (561 pp.; $8.00).

Designed as a school science text, this is an excellent source book on energy fundamentals for students. Basic topics in physics and chemistry are treated here, but the discussion is energy-oriented and jazzy, with catchy chapter titles, excellent graphics, and lots of ideas for student activities and experiments. A particularly good section on photography accompanies the discussion of light, and this is followed by a very careful, yet readable explication of electricity. Other units deal with motion, heat, and chemistry, all of them relying on the metric system of measurement (which is carefully explained in one of the appendices).

2) The Wonderful World of Energy, Lancelot Hogben (New York: Doubleday & Co.) 1968 (96 pp.; $3.95).

Beginning with a description of muscle power and the kinds of works that were built before the invention of machines, Hogben provides a very interesting and informative account of the history of the mechanical conversion of energy into power. Wheels, levers, and pulleys are traced back to their earliest uses, with excellent drawings and photographs accompanying the text. The men whose contributions to the understanding of energy were instrumental in increasing the efficiency with which we work, men like Galileo, Hooke, Kepler and Newton, are described in terms of their historical importance. The development of the steam engine is examined in some detail, accompanied by a good, clear discussion of conversion efficiencies and how they are calculated. Electricity and nuclear power are the focus of the last two chapters, and a very useful glossary is appended.

3) Gift from the Sun: The Mastering of Energy, Margaret Cooper (Englewood Cliffs, New Jersey: Bradbury Press) 1969 (181 pp.; $5.95).

Very qualitative in approach, this is an extremely readable and well-illustrated account of the evolution of man's harnessing of energy. Beginning with "Basic Discoveries," Cooper reviews the prehistoric knowledge of fire and toolmaking, early agricultural applications of energy, and the discovery of the forging of iron tools and weapons. Transmission and conversion of energy in modern times are examined in chapters dealing with automation, combustion, furnaces, pumps, gravity, steam and transportation. Finally, in "The Upward Surge," the focus is on electricity and on the crucial role that form of energy has had in the maturing of the industrialized world.

4) Energy Does Matter, Scientists of the Westinghouse Research Laboratories (New York: Walker and Co.) 1964 (250 pp.; $6.95).

Although somewhat out of date, this textbook for high school science students contains a good, basic discussion of the nature of energy, motion and its equations, mathematics for heat, and electricity. "Energy, Engines and Economics" is a chapter which examines conversion efficiency and supply-demand problems. All of this is done in very concise, straightforward text discussions and, despite its early date, there is still a great deal to recommend this text as a resource for students interested in the laws and physical properties that govern the study of energy.

5) "The Energy Cycle of the Biosphere," George M. Woodwell, pp. 25-37 in **The Biosphere** (San Francisco: Freeman & Co.) 1970 (134 pp.; $3.25; Originally appeared in **Scientific American,** September 1970).

This is a beautifully written, well-documented essay on the role of green plants in the energy cycle of the biosphere. It is a companion article to "The Energy Cycle of the Earth" (Part I, Section II-5) and one in a series of essays that comprise this **Scientific American** special issue on the biosphere. While biology students should find this an especially interesting approach to the study of energy, it should also prove interesting and informative to any student with good reading ability and some skill in interpreting simple graphs.

III Energy Resources

1) Fuels and Power, E.N. Davies and S.A. Johnson (New York: Pergamon Press) 1969 (200 pp.; $5.95).

One in a series of economic geographies, this fully-illustrated summary of world resources is designed to provide the general reader with a highly visual introduction to the location, extent, and utilization of the world's supply of fossil and fissile fuels. Separate chapters are directed to the examination of coal, petroleum, natural gas, electricity, and nuclear (fissile) fuels. Good descriptions of how each fuel was formed are provided, along with a brief summary of the ways in which the various fuels are commonly used. The use of illustrations succeeds extremely well here and this should be a useful and attractive reference for students with a wide range of reading abilities.

2) Our Natural Resources, P.E. McNall and Harry B. Kircher (Danville, Illinois: The Interstate Printers & Publishers, Inc.) 1970 (296 pp.; $4.95).

Very much a standard text in format, this treatment of natural resources includes an excellent, factual introduction to the realities of resource limitations. Separate chapters are focused on the character of natural resources, their economic worth, the increasing use of energy resources, wind and water power, the fossil fuels, and nuclear and solar energy. The understanding of basic concepts and the development of vocabulary are stressed, along with a good, concise introduction to the quantitative dimensions of our energy supply-demand situation. Other chapters examine the related topics of non-fuel mineral resources and conservation of water, forest, soil, and wildlife. Questions are included at the end of each chapter and illustrations and tables are plentiful.

3) "The Fascinating Story of the Fossil Fuels," Isaac Asimov, **National Wildlife 11** (5): 7-11, August/September 1973.

Directed to the basic questions of how energy resources were formed, how they have been put to use by man, and how much of them we have remaining for our use, this brief article contains a good, readable summary of the role of the fossil fuels in our energy future. Several illustrations accompany the text, including two helpful charts: "Energy: What Is It?" and "Fossil Fuels: Who Has It? Who Uses It?"

4) "The Energy Resources of the Earth," M. King Hubbert, **Scientific American 224:** 60-70, September 1971.

One in a series of articles that comprise a special issue on energy, Hubbert's article provides an excellent summation of our resource situation. Hubbert notes at the outset that, "from the standpoint of human history, the epoch of the fossil fuels will be quite brief." There are numerous tables and graphs and, while Hubbert writes clearly and well, this is an article directed to the student with good reading ability and with some skill at interpreting data displayed in graphs and tables. It is an extremely informative and interesting overview, however, well worth the additional effort of close study.

5) "In Quest of Energy," Chapter 10 (pp. 203-230) in **Environment and Man,** Richard H. Wagner (New York: W.W. Norton & Co.) 1974 (528 pp.; $7.95).

Designed for general readers and non-science students at the undergraduate level, this is an excellent, up-to-date summary of the energy situation. Wagner describes the various fossil fuels in terms of their occurrence, recovery technology and use, providing special attention to the environmental problems associated with their extraction and consumption. Nuclear energy, fission and fusion, are discussed at some length, and brief summaries are provided of the potential of the various "new sources": wind, water, tidal, geothermal, and solar power. Energy economics and conservation are addressed briefly and a number of useful graphs and illustrations are included.

6) "The Story of Natural Gas Energy," Harold W. Springborn (Washington: American Gas Association) 1974 (48 pp.; Available on request from: American Gas Association, 1515 Wilson Blvd., Arlington, Virginia 22209).

This is an extremely readable and informative little primer on natural gas which includes coverage of everything from the formation, discovery, and production of gas to all the various ways it is put to use. Fully-illustrated, with numerous photographs, drawings, and pie diagrams, this is an excellent introduction to the topic of natural gas and one that answers many commonly asked questions.

7) "One Barrel of Oil," Robert W. Stock, **The New York Times Magazine:** 14-17, April 21, 1974.

This is an unusual article which provides answers to a host of questions about the transformation of oil in the ground into the fuel that powers our automobiles, home heating, etc. Stock provides a brief history of the origins of oil and then follows the course of one barrel of oil as it moves from the field well through all the various pipelines, pumping stations, and refining processes that convert it into the fuel we consume in our daily use of energy. It is a fascinating account of both the physical and economical aspect of oil processing, and it is one that is sure to have wide appeal. In fact, this could well serve as the basis for any number of student activities and projects.

IV Electric Power

1) The Race for Electric Power, Jerry Grey (Philadelphia: Westminster Press) 1972 (122 pp.; $5.95).

Directed specifically to high school students, this is a thoroughly readable book about electricity in our energy future. Grey looks at how electricity is generated, converted, transmitted, and used and at the nature of the supply problems that are growing increasingly severe. The trade-offs involved in decisions regarding electric power and the environment are discussed and a thoughtful examination of the complexities involved in formulating a national energy policy is provided.

2) Environmental Cost of Electric Power, Dean E. Abrahamson, A Scientists Institute for Public Information (SIPI) Workbook (New York: SIPI) 1970 (36 pp.; $1.00; Available from: SIPI, 30 East 68th Street, New York, New York 10021).

This is one in a series of very popular workbooks on various environmental topics. All are well-suited to a general or student audience and each provides excellent summary essays on specific aspects of a particular environmental topic, along with useful tables and a good selection of bibliographic references. Topics treated in this particular workbook include: Power Per Person; How Much Does It Really Cost?; Power Steering; and Why More Power?

3) Electricity: How It Works, Percy Dunsheath (New York: Thomas Y. Crowell Company) 1960 (248 pp.; $3.95).

In clear, straightforward language, Dunsheath explores the nature of electricity, the discovery and experimentation with static electricity and magnetism, and the various ways in which electricity is converted and put to use in our homes and industries. A number of easy-to-do experiments are suggested and a particularly informative discussion of the mechanical generation of electricity is included.

4) "Hydroelectric Energy," Chapter 3 (pp. 51-57) in **Energy,** John Holdren and Philip Herrera (San Francisco: Sierra Club Books) 1971 (252 pp., $2.75).

This is an excellent, brief summary of the pros and cons of hydroelectric power which provides both a very useful statement of the issues involved and some good, basic data to suggest the magnitude of the impact of electric power generation on the environment. The implications of building dams and reservoirs are briefly outlined and a short description of the pumped storage process is included.

5) "The Price of Power," Anthony Wolff, **Harpers 244:** 36-38, May 1972.

In May 1972 the Council on Economic Priorities published a lengthy and detailed study of the impact of electric power generation on the environment (Part I, Section VIII-3). In this brief article, Wolff provides a popularized summary of the major findings of that study, with particular emphasis on the rate of increase in our demand for electric power and on the growing problem of air pollution from electric power generation. Excellent summary data are provided, with specific reference to the major polluters and the cleanest power plants as identified in the original report. This is a very useful, nontechnical summary, providing access to a very important, but formidable, report.

V Energy Into Power

1) Energy into Power: The Story of Man and Machines, E.G. Sterland (Garden City, New York: The Natural History Press) 1967 (252 pp.; $3.50).

Published for the American Museum of Natural History, this recounting of man's technological development combines an interesting and informative text with an excellent collection of drawings and photographs. Section I, "Sources of Energy," provides a look at the solar energy balance along with a brief examination of fossil fuels and nuclear power. An excellent discussion of energy conversion is provided in the four chapters of Section II: Basic Principles, Kinetic Energy in Fluids, Rotary Engine Converters, and Air Breathing Machines. Finally in "Looking Ahead," some of the potentially more efficient energy conversion systems are examined: fuel cells, solar collectors, fusion, MHD, etc. Very little in the way of science or mathematics background is assumed here, making this a particularly good introduction to this topic for the general student.

2) The World of Power and Energy, Frank Ross, Jr. (New York: Lothrop, Lee and Shepard Co., Inc.) 1967 (224 pp.; $4.75).

Illustrated with photographs and drawings by the author, this is an extremely readable and attractive book on how we use energy from a variety of sources: Energy from the Sun, Energy from the Sky, Water Energy, Energy from the Depths of the Earth, and Energy from Fossil Fuels. The steam engine, internal combustion engine and chemical and nuclear energy are each examined in very qualitative, straightforward discussions geared to the background of the general student.

3) Energy and Engines, D.S. Halacy, Jr. (New York: The World Publishing Company) 1967 (223 pp.).

Fairly quantitative and science oriented, this tracing of man's harnessing of energy from prehistoric times to the present focuses on the demand for greater efficiency and the technological advances which have been developed to meet that need. The fundamentals of energy and power — thermodynamics, energy conversions, etc. — are briefly examined in terms of their application in the development of aircraft, space vehicles, solar batteries, and nuclear energy. Finally, Halacy looks to the technology of the future, providing good, informative discussions of direct energy conversion, fusion, and a variety of "exotic" energy sources.

4) Power: Mechanics of Energy Control, Ralph C. Bohn and Angus J. MacDonald (Bloomington, Illinois: McKnight and McKnight) 1970 (258 pp.; $8.50).

Essentially an industrial arts text for high school students, this manual provides a good overview of energy applications in the home and in industry. Particular attention is paid to the transmission and control of power through mechanical, fluid, and electrical devices. There are excellent illustrations of a variety of power systems, with special emphasis on the internal combustion engine, batteries, and simple circuits. Principles of physical science and mathematics are integrated throughout the text and a number of student projects and activities are suggested.

5) Windmills and Watermills, John Reynolds (London: Hugh Evelyn Ltd) 1970 (196 pp.) Available from: Hugh Evelyn Limited, 9 Fitzroy Square, London W1P5AH, England.

Published in England, this is a beautiful book which has become increasingly popular here. Magnificent photographs and an extremely readable text have been combined to tell the story of man's use of power from wind and water. The origin and development of these power sources are discussed and separate chapters provide examination of Water Wheels and Millstones, The Machinery of the Watermill, The Wind Powered Corn Mill, The Use of Water Power in the Textile Industry, and Wind and Water Powered Drainage Mills. Illustrations have been taken from working mills all over the world and are artfully combined with drawings and sketches of the mills that powered earlier civilizations.

VI Supply and Demand

1) Outlook for Energy in the United States to 1985, John G. Winger, et al. (New York: The Chase Manhattan Bank) 1972 (56 pp.).

Prepared by the energy-economics division of the Chase Manhattan Bank, this is an excellent, brief summary of the demands our nation makes on its limited energy supplies. Commercial, transportation, industrial, and personal consumption are each reviewed separately with the aid of very clear, simple graphs. The various energy resources, petroleum, natural gas, coal, nuclear energy, and hydroelectric power are each discussed in terms of the special characteristics that determine their availability and usefulness.

2) Brownout and Slow Down, Richard Saltonstall, Jr. and James K. Page, Jr. (New York: Walker & Co.) 1972 (200 pp.; $5.95).

There are really two topics at issue here, electrical power and energy for transportation. In "Who Needs Energy?" the authors review the demand for electricity in various sectors of the economy and provide a good, basic introduction to how electricity is made from hydropower, coal, oil, and natural gas. The effects electric

power generation has on the environment are briefly described, with special attention to air pollution, thermal pollution, oil spills, and the various problems associated with nuclear power. A series of policy recommendations is provided in "To Keep the Lights Burning," along with a look at the potential of some future technologies. Part II, "Transportation," focuses on the American love of the automobile and the ways that mode of transportation impacts on our energy resources and on the quality of our environment. Policy recommendations are made at the end.

3) "Enough Energy — If Resources are Allocated Right," Special Report, **Business Week:** 50-59, April 21, 1973.

A good business perspective on the energy crisis is provided in this brief summary of U.S. energy supply and demand problems. Some of the reasons for the current problems in meeting the nation's energy needs are explored, with particular attention to the problems of natural gas availability and regulation. A good discussion of oil refinery capacity is included, along with an assessment of the role of coal in the next decade. Problems, mostly technological and financial, with such future fuels as nuclear power, oil shale, geothermal power, and tar sands are noted, and a final section looks at a variety of ways to curb the nation's appetite for energy.

4) "Energy Crisis — Are We Running Out?" **Time 99:** 49-55, June 12, 1972.

This is a highly readable, illustrated account of the U.S. energy supply-demand situation. Some introductory remarks point out the possibilities of future blackouts and brownouts and a brief review of energy resources statistics follows. Oil, natural gas, and coal are each examined in terms of supply-demand figures and the problems of siting nuclear power plants are briefly noted. An overview of the ways in which pollution from power could be reduced is provided and the final sections examine potential sources of the future: fusion, geothermal energy, and solar power.

5) "America's Energy Potential: A Summary and Explanation," Prepared by Congressman Morris K. Udall for the Use of the Committee on Interior and Insular Affairs of the U.S. House of Representatives, 93rd Congress, (Washington: USGPO) 1973 (19 pp.; Available from the Committee on request).

Focused on the status and outlook for each of our remaining resources, this brief report provides an extremely useful summary of energy supply-demand data and a very informative overview of the technological limitations currently restricting the efficiency with which we exploit known resources.

6) "The Energy Joyride is Over," Edmund Faltermayer, **Fortune 86:** 99-103 +, September 1972.

Noting that "Technology and good sense can stretch our resources, but only a big breakthrough can bring back cheap fuel and power," Faltermayer provides an extensive and detailed account of our energy resources in terms of current and projected needs. Each of the major fuels is reviewed in turn, with special emphasis on the state of the technology associated with its production. Excellent graphs accompany the text and good, up-to-date descriptive information, fully documented, is provided throughout.

VII Nuclear Power

1) The New World of the Atom, James Stokley (New York: Ives Washburn, Inc.) 1970 (332 pp.; $8.95).

Originally issued in 1957, this history of nuclear power has been updated to include discussions of a variety of current topics: the fusion process, the world's need for energy, reactors for power and research, nuclear power plants, environment and safety, nuclear transportation, and making new elements. The text is extremely well written, and there is a fairly good selection of illustrations. All in all, a very comprehensive and readable treatment of the whole nuclear power topic.

2) Roads to Discovery, Ralph E. Lapp (New York: Harper & Row) 1960 (191 pp.).

This is an excellent summation of the discoveries which led to our current understanding of nuclear energy, and Lapp provides a fascinating account of the men who researched the atom, from Roentgen and Rutherford to Niels Bohr. Fission is described briefly and separate chapters are directed to discussions of nuclear structure, uranium energy, the control of nuclear chain reactions, and the development of the peacetime nuclear industry.

3) "A Nuclear Primer," **The Orange Disc 21** (3): 16-23, January/February 1974 (Entire issue free on request from: Gulf Oil Corporation, Gulf Building, Box 1166, Pittsburgh, Pennsylvania 15230).

The Orange Disc is a very attractive and informative magazine prepared for the use of Gulf employees and shareholders. It is, however, available to the public on request and this brief article is well worth writing for. Excellent graphics accompany the text discussion which provides a good, easy-to-read explanation of what reactors are, how they work, the meaning of fission, and the importance of uranium.

4) A Citizens' Guide to Nuclear Power, Ralph E. Lapp (Washington: **The New Republic**) 1971 (55 pp.; $.75; Available from: **The New Republic**, 1244 19th Street. N.W., Washington, D.C. 20036).

Lapp is a noted commentator on this country's nuclear power program and in this booklet he provides an excellent summary of some of the major questions relating to the safety and policy aspects of nuclear power. These include questions of the future fuel mix, the proper siting of nuclear power plants, assurance of thermal protection for our waterways, development of reliable long-distance power transmission technology, the financing of energy R & D, and the conservation of national energy resources. All of this is written on a very popular level and the booklet provides a good, readable primer on some crucial issues in the nuclear power debate.

5) "Nuclear Power and the Environment — Questions and Answers," American Nuclear Society (Hinsdale, Illinois: American Nuclear Society) 1973 (64 pp.; $1.50; Available from: ANS, 244 East Ogden Avenue, Hinsdale, Illinois 60521).

Written in a question-answer format, this brochure provides a concise response to a wide range of questions about nuclear power. Radiation, thermal discharge, transportation, safety, and siting are discussed along with brief treatments of future power sources, including fusion and the breeder reactor. Numerous illustrations and charts accompany the text and a good list of references is included.

6) "Nuclear Power Safety," Jerry Grey (New York: Atomic Industrial Forum, Inc.) 1974 (24 pp.; Available from: Atomic Industrial Forum, Inc., 475 Park Avenue South, New York, New York 10016).

Prepared under the auspices of the AIF Committee on Public Affairs and Information, this is a very useful description of the care and thoroughness the nuclear industry has applied to safety design in power plants. Pictures of containment vessels and cooling systems are included with the text discussion which provides response to many of the criticisms that have been directed to the nuclear industry.

7) Perils of the Peaceful Atom, Richard Curtis and Elizabeth Hogan (New York: Ballantine Books) 1969 (357 pp.; $4.95).

Subtitled "The Myth of Safe Nuclear Power Plants," this is a scathing commentary on the real and potential dangers inherent in the production and use of nuclear power. Fascinating and at times frightening accounts are provided of the meltdown of the experimental "Fermi" breeder reactor, the carelessness associated with the disappearance of the nuclear submarine Thresher, and assorted minor accidents and problems that have cast doubt on the nuclear industry's claim of a good safety record. Extremely readable and carefully documented from newspaper accounts, government hearings and reports, this is a book which raises many questions about the wisdom of the peacetime atomic energy program.

8) Nuclear Dilemma, Gene Bryerton (New York: Ballantine Books) 1970 (138 pp.; $1.25).

A Friends of the Earth book, this combines elements of the pro and con arguments in the nuclear debate. Quoting extensively from critics on both sides of the issue, Bryerton provides an interesting overview of the complexity of the nuclear safety question. The emphasis, ultimately, however, is on the negative aspects of nuclear power, and a good deal of the text is directed to detailing reactor accidents and incidents of radioactive leaks. Several drawings are included and a good discussion is provided of the design and operation of reactor safety systems and the biological effects of radiation exposure.

VIII Environmental Effects

1) Air Pollution, Virginia Brodine (New York: Harcourt, Brace & Jovanovich) 1973 (200 pp.; $3.95).

This is an excellent nontechnical discussion of air pollution written by a long-time associate of **Environment** magazine. Clear, concise, and extremely readable, it provides a good general discussion of what air pollution is and where it comes from, along with an interesting discussion of the magnitude of the environmental impact of air pollutants. Illustrated by fascinating accounts of some of the major air pollution incidents, this is a good source of background information for students and teachers alike.

2) "Air Pollution," Chapter 10 (pp. 171-197) in **Our Precarious Habitat,** Melvin A. Benarde (New York: W.W. Norton & Co.) 1970 (362 pp.; $2.95).

Written by a medical doctor whose professional interests and activities have long been centered on public health issues, this discussion provides especially good coverage of the health effects aspects of air pollution. There is good information here also on the causes and the meteorology of air pollution, with numerous tables, graphs, and drawings included to illustrate the text.

3) "Cloud on the Desert," Roy Craig, **Environment 13** (6): 21-24 +, July/August 1971.

Noting that "The combined emission of roughly 400 tons of fly ash per day from the five operating units of the Four Corners Plant make it possibly the worst single source of air pollution in the world," Craig provides an analysis of what went wrong at Four Corners and some useful, informative observations on the general problem of sulfur dioxide emission. Some excellent photographs illustrate Craig's commentary on the aesthetic problems of air pollution and an excellent list of notes at the end of the 12-page article provide suggestions for further reading.

4) "Appalachia — Like the Flayed Back of a Man," James Branscone, **The New York Times Magazine:** 30-31 +, December 12, 1971.

Branscone, a native of Kentucky, is director of Save Our Kentucky, Inc., a coalition of groups opposed to strip mining. The account he provides here is both informative and moving, providing not only details of how strip mining is done, but a feeling for the impact that the men and machines of the coal industry have had on the land and people of Appalachia. It is a long, thoughtful article, full of good descriptive information and accompanied by excellent photographs (particularly the cover photograph of strip mined land).

5) "The Cost of Coal," George E. Dials and Elizabeth C. Moore, **Environment 16:** 18-24 +, September 1974.

A host of problems associated with the mining of coal are delineated in this lengthy, well-illustrated article written by two concerned West Virginians who argue that what coal mining does to people and to land should be factored into the actual cost of this crucial fossil fuel. The article is divided into two sections, one on underground mining and the other on surface mining, including both strip and auger methods. Nine problem areas are addressed in the section on underground mining: mine fires, disposal of mine wastes, acid mine drainage, sub-

sidence, accidents, loss of potential production due to accidents, loss of earnings due to nonfatal disabling accidents, loss of earnings due to fatal accidents, and the cost of black lung disease. The section on surface mining focuses on the problems and costs of land reclamation and a summary is provided of the advances which have been made in West Germany in recovering damaged coal lands. Special acid mine drainage and sedimentation problems associated with this form of mining are detailed and the kinds of social costs involved, including loss of recreational lands, are discussed briefly. Excellent illustrations accompany this article, along with a good list of references.

6) "What Price Coal?" Ben A. Franklin, **The New York Times Magazine:** 26-27 +, September 29, 1974.

Only distance from the major consuming areas of this country has prevented massive stripping of the rich fields in North Dakota. The recent energy shortages, however, have brought increased attention to the potential of mining this relatively low-quality lignite. This is essentially the story of the plans being made for the future of that area and of the determination of the people of North Dakota to prevent the kind of stripping carelessness that has left barren so much of West Virginia and Kentucky. It is a dramatic example of the "trade-off" aspect of the energy-environment dilemma and raises some important issues for consideration.

7) "Oil on Ice," Rene O. Ramseier, **Environment 16** (4): 6-14, May 1974.

While all oil spills pose serious threats to the marine environment, those which might occur in the Arctic, where spills could be trapped under the ice, could pose a particularly profound threat to global ecology. This is an excellent summary of the environmental considerations at issue in marine drilling for oil. A good selection of illustrations and tables dramatize the importance of protecting the Arctic wilderness from accidents and spills.

IX Future Energy Sources

1) How Will We Meet the Energy Crisis? Reed Millard and Science Book Associates (New York: Simon & Schuster) 1971 (189 pp.; $4.50).

This is a good, single-source reference on future energy technology, providing the reader with a brief introduction to the problems of conversion efficiency and a fairly comprehensive summary of the potentials and problems of a variety of power-generating schemes. Chapter titles include: Fuels for Power Without Pollution; Power from the Atom; How Safe Are Atomic Power Plants; Miniature Power Plants; Power from the Earth; Power from the Sea, and Power from the Sun. A number of photographs illustrate the uniformly readable and nontechnical text discussion.

2) The Coming Age of Solar Energy, D.S. Halacy, Jr. (New York: Harper & Row) 1973 (231 pp.; $7.95).

Revised from a 1963 edition, this updated version includes excellent illustrations and a fascinating account of the history of man's attempts to understand and harness the sun's energy. Halacy focuses on some of the exciting concepts and hardware being explored and tested, including orbiting solar collectors and the concept of the solar farm.

3) Solar Energy for Man, B.J. Brinkworth (New York: John Wiley & Sons) 1972 (251 pp.; $8.95).

More technical than the Halacy book, this is a discussion of solar energy clearly aimed at the student with a strong interest in science. There are few illustrations here, but Brinkworth does include a good selection of tables and graphs. Fundamental energy principles are briefly reviewed, a short discussion of the origin of the solar system and the physics of radiation are included, and a fairly detailed summary is given of the problems of collecting and storing solar energy. There is some interesting material here on photoelectricity, photochemistry, and photobiology, along with careful exposition of some fundamental energy conversion calculations. For the serious student, this should prove to be an extremely informative introduction to a wide range of solar energy topics.

4) Experiments with Solar Energy, D.S. Halacy, Jr. (New York: W.W. Norton & Co., Inc.) 1969 (170 pp.; $4.50).

A very brief discussion of solar energy introduces this volume, but for the most part this is a collection of science-fair type projects and experiments which show the utilization of solar energy in heating, cooking, and powering small devices. A lot of good ideas, each carefully illustrated and explained in step-by-step directions, should prove both fun and easy to follow.

5) "Tapping Earth's Teakettle," Gary Soucie, **Audubon: 107**-111, May 1972.

Both the potential and the problems associated with geothermal energy are explored in this brief article. The threats to the beauty of the California valleys, where exploration and development are currently underway, are detailed and the "trade-off" nature of the decision to go ahead and drill for what promises to be clean, cheap power is developed as a model of the kind of energy-environment decisions that have to be made.

6) "Clean Power from Inside the Earth," **Saturday Review: 53**-61, December 5, 1970.

For the most part, this is an account of the geothermal exploration currently underway at the Salton Trough in Mexico, but the article also contains some good, basic information on the nature of geothermal energy and the problems characteristic to its exploration and development. Some good pictures are included of working geothermal areas in Iceland and New Zealand. The tenor of the article is very optimistic, conveying a strong enthusiasm for the potential tapping of the earth's heat energy.

7) "Windmills," Julian McCaull, **Environment 15:** 6-17, January/February 1973.

Premised on the idea that wind power, tapped on a large scale, could produce prodigious amounts of electricity, this is a fascinating account of early experiments with windmill design and a thorough, well-illustrated

description of some recent U.S. experiments with schemes to harness the wind's power. Descriptions are provided of the actual mechanics of windmill design and of the engineering considerations involved in trying to obtain maximum efficiency. Some discussion of the economics of windmills is included and a section on "the world picture" provides a good idea of the countries which might profit from large-scale efforts to utilize wind power. Excellent pictures and diagrams accompany the text, along with a good list of suggested references.

8) "Oil Shale — Pandora's New Box," Gary Soucie, **Audubon 174:** 106-112, 1972.

Recently there has been renewed interest in the possibility of obtaining oil from shale and this is a good, popular-level discussion of what oil shale is, where it occurs, how it might be mined, and what kind of effects such an undertaking would have on the environment. Particular attention is directed to the Green River Shale, one of the richest deposits known in this country, and the discussion includes excellent maps, drawings, and photographs.

X Energy Conservation

1) Lifestyle Index, Albert J. Fritsch and Barry I. Castleman (Washington: Center for Science in the Public Interest) 1974 (60 pp.; $1.50).

Probably the best way to begin the study of energy conservation is to examine our personal habits of consumption and that is precisely what this book is designed to help us do. What is startling to see is the comparison of the energy each American uses each year against the amount used by people in the rest of the world. Some very useful tables on consumption patterns are appended, making this an excellent, "quick study" on energy consumption and conservation.

2) "Energy and Well-being," A.B. Makhijani and A.J. Lichtenberg, **Environment 14** (5): 10-18, June 1972.

This is a fairly sophisticated, but extremely informative examination of how improvements can be made on the present inefficiencies in our use of energy. The authors look at energy consumption and standards of living, patterns of energy and materials usage, and ways to reduce energy and raw materials consumption. Some very interesting data are included in the tables which accompany the text, and several illustrations are provided to show the scale of our present energy enterprise. Definitely geared to the serious student, this article contains a wealth of information on how we use and misuse the energy available to us.

3) "Individual Action for Energy Conservation," Prepared by the Subcommittee on Energy of the Committee on Science and Astronautics, U.S. House of Representatives, 93rd Congress (Washington: USGPO) 1973 (5 pages; Available on request from the Committee).

Essentially a compilation of suggestions for actions that citizens can take in their daily lives to help conserve the nation's energy, this five-page booklet provides a valuable guide to energy use in transportation, household heating and cooling, and the use of small appliances. Many of them are simple common-sense suggestions, but it is useful to have them all in one place and this could easily form the basis for a good classroom discussion of energy conservation.

4) "Getting It Together," Michael Corr and Dan MacLeod, **Environment 14** (9): 2-9, November 1972.

Communal living offers some real advantages in terms of energy conservation and many of them are detailed in this interesting and informative article. Much of this is based on a study of 12 communes in the Minneapolis area and, while there are many difficulties with the accuracy of the questionnaire results, they do provide some interesting indications of the relationship between lifestyle and energy consumption. Specific attention is directed to the use of appliances, modes of transportation, home heating, and the use of hot water. This latter examination provides an interesting comparison of the energy efficiencies of bath vs. shower and handwashing of dishes vs. the use of automatic dishwashers, etc.

5) "There Are Ways to Help Buildings Conserve Energy," Jane Stein, **Smithsonian 4** (7): 28-35, October 1973.

Beautifully illustrated, this brief look into the influence architecture and the construction industry have on energy use poses some interesting questions for analysis and provides a good summary of how building design affects energy costs. Pointed out for particular criticism as an "energy hog" is the new World Trade Center in New York City, which requires as much energy per year as does the whole city of Schenectady, which has a population of 100,000. Noting that the amount of energy a building needs for heating, cooling, and lighting is a function of its site, shape, and construction materials, Stein reviews architectural practice from early times to present and points out the efficiencies and inefficiencies of various designs. Recommendations are made for better insulation, sensible lighting, etc., and it's all done in a very interesting and attractive way.

6) "A Matter of Design," Richard G. Stein, **Environment 14** (8): 17-20+, October 1972.

More quantitative and detailed than the **Smithsonian** article, this analysis of the architecture-energy relationship is premised on a similar thesis: "Architecture has a greater influence on energy use than any other major component of the Gross National Product except transportation and the military." Attention is focused on choice of building materials, levels of lighting, and the design of heating and cooling systems. A particularly good analysis of the energy intensiveness of high-rise buildings is provided and, while this article requires rather serious study, it gives an excellent introduction to an important aspect of energy conservation.

7) "Recycling: Assessment & Prospects for Success," Arsen Darnay (Washington: USGPO) 1972 (14 pp.).

While this is a very brief discussion of a complex topic, it does provide a good introduction to the rationale of recycling, the importance re-use has in the overall energy scheme, and the problems and economic questions that affect the scale of recycling activities in this country. The text is entirely descriptive, but it does provide some sense of the magnitude of our materials-use problem and of the effect improved and expanded recycling efforts could have on our energy supply.

XI Energy Policy

1) Exploring Energy Choices, A Preliminary Report (Washington: The Ford Foundation) 1974 (81 pp.; $.75; Available from: The Energy Policy Project, P.O. Box 23212, Washington, D.C. 20024).

This is the first publication of the Ford Energy Policy Project and it provides a good summary overview of many of the policy questions addressed in detail in the Project's final report, **A Time to Choose** Part I, Section XI-1). Topics treated here include: The Energy Gap, Energy Policy, Objectives, Goals and Constraints, U.S. Energy Policy in the World Arena, Environment and Energy, Federal Energy Resources, The Next Few Years, Choices and Limits, and Looking Forward. Most of the technical information and background data have been put in the appendices, much of it displayed in excellent graphs and charts, so that the text itself is quite descriptive and reads easily.

2) Debate Handbook on Federal Control of Energy, J. Weston Walch (Portland, Maine: J. Weston Walch) 1973 (186 pp.). Available from J. Weston Walch, Publisher, Box 658, Portland, Maine 04104.

Essentially a primer on energy policy, this is a valuable, single-source reference on the major issues related to U.S. energy policy decisions. Chapters one through four provide a concise, documented introduction to energy fundamentals: what energy is, how it occurs, its uses and regulation, the nature of today's energy problems, and the possibilities for change in the future. Detailed background information, along with specific evidence for affirmative and negative argument on various policy questions, are provided in the remaining chapters. There is also a very useful bibliography of nontechnical articles and a "Who's Who in Energy" section provides identification of the people involved in energy policy formulation.

3) Energy Controls: The Energy Users Guide to Meeting the Energy Crisis (Englewood Cliffs, New Jersey: Prentice Hall) 1974 (Subscription service available to libraries at yearly rates).

So much is happening in U.S. energy policy now that it's difficult to keep pace with all the legislation and decisions issued. This looseleaf reference book is designed to combat that problem by providing a weekly newsletter on energy developments along with a running index to federal legislation and policy statements from the various government offices and agencies. Major legislation from Congress is reprinted, along with a good sampling of special reports and background papers prepared by various sources, all of it geared to a general reading audience.

4) "The Ecopolitics of Oil," Richard C. Longworth, **Saturday Review World 1:** 25-26, January 26, 1974.

This is an excellent, brief summary of the complexities of the oil supply situation and its impact on world monetary decisions. Very descriptive and nontechnical, it provides a quick overview of the problem's scale and political implications, along with some thoughtful observations on the wastefulness with which the U.S. consumes world energy supplies.

5) "Countering the Oil Cartel," **Time:** 36-38, November 25, 1974.

In a major policy address at the University of Chicago in mid-November 1974, Secretary Kissinger outlined a program of international cooperation designed to curtail the economic impact of the oil-producing nations pricing policies. In this brief report on that talk, **Time** provides a good summary of the major issues involved in the international oil market, with particularly useful observations on the effects of oil politics on international finance.

6) "Energy Policy in the U.S.," David J. Rose, **Scientific American 230** (1): 20-29, January 1974.

Arguing that the idea of U.S. energy "self-sufficiency" by 1980 is unrealistic, Rose discusses the long-range options open to the nation. Assessments of a variety of possible energy technologies are analyzed in a kind of "taxonomy" or listing in logical hierarchy. Very useful and informative graphs and diagrams accompany the text, providing an excellent overview of U.S. energy policy alternatives.

PART III
Readings for Students
(Grades 5-9)

ENERGY-ENVIRONMENT MATERIALS GUIDE

Part III

SUGGESTED READINGS FOR STUDENTS: GRADES 5-9

An annotated bibliography of books and articles for students (Grades 5-9).

I Basic General References

1) Disappearing Energy: Can We End the Crisis? Dorothy E. Shuttlesworth and Lee Ann Williams (Garden City: Doubleday) 1974 (Approximately 75 pp.; $5.95).

This new volume by the authors of books on air and water pollution discusses sources of energy and their rapid depletion. Black-and-white photographs enhance a very readable, conservation-oriented text. Other topics include: environmental effects of obtaining and using various fuels and energy use and public policy.

2) The Whole Earth Energy Crisis, John H. Woodburn (New York: Putnam) 1973 (190 pp.; $4.89).

This is one of the few books for junior high school readers that deals with the whole range of topics associated with the energy problem. Included are: the dwindling supply of energy resources, discussion of environmental effects associated with present energy use, possible future energy sources, and some of the difficulties associated with energy policy development.

3) Popular Science, March 1974, Special 13-page section on energy.

"The Energy Pinch — Where do We go from Here?" "Can Sunshine Heat (and Cool) Your House?" and "New Coal Technology: the Cinderella Fuel" are three good summary articles with many specific examples. The energy article includes a chart of energy sources and consumption.

II Energy Fundamentals

1) The Heat's On, Bertram M. Siegel (Englewood Cliffs, New Jersey: Prentice-Hall) 1970 (63 pp.; $4.50).

Readers find out what heat energy is the same way that scientists do — by experiment. All the experiments in this book are well illustrated and use common household materials.

2) Nature and Energy and **Machines and Energy,** Eric J. Barker and W.F. Millard (New York: Arco) 1966 (96 pp. and 80 pp.; $4.50 ea; $1.95 pa ea).

These books of "Science Projects and Experiments for the Junior Scientist" discuss basic physics principles and concepts using an energy orientation. Concepts are developed through experiment and observation. Side excursions note practical applications that have been used and famous men and women of science. The **Machines and Energy** volume covers energy sources and machine uses and the ways the sun acts as a primary energy source.

3) Push and Pull: the Story of Energy, Paul Blackwood (New York: McGraw-Hill) 1959 (190 pp.; $4.50).

This popular and readable book on the physics of energy covers solar, mechanical, chemical, radiant, and nuclear energy. Separate chapters give detailed explanations followed by simple experiments and many examples of applications familiar to the student reader. A glossary and extensive index are included.

4) The Wonder of Heat Energy, Hy Ruchlis (New York: Harpers) 1961 (186 pp.; $4.50).

The importance of heat, its effects and uses act as background for comparison of heat energy with other forms of energy.

5) Wonders of Heat and Light, Owen S. Lieberg (New York: Dodd-Mead) 1966 (64 pp.; o.p.).

This book describes and explains the physical principles behind solar, heat, and geothermal energy.

6) Your World in Motion, George Barrow (New York: Harcourt, Brace, & World) 1956 (181 pp.; $2.95).

A former science teacher explains energy in terms of motion. Topics covered include wind, heat, the sun, electricity, and atomic energy. The text is very clear and interesting to read.

III Energy Resources

1) About Coal Gasification, Channing L. Bete, Greenfield, Massachusetts, 1974.

This booklet in the Scriptographic series uses cartoons and graphics to explain in an especially clear way: coal gasification, the need for it, and how it can be done.

2) The First Book of Oil, Beatrice and Arthur Shilstone (New York: Watts) 1969 (90 pp.; $3.95).

A very attractive and interesting book using black-and-white drawings and graphs describes ancient and modern uses of oil, as well as exploration, drilling, transporting, and refining. The future of oil is also discussed including new ways to find and recover it and oil shale prospects.

3) Flowing Gold: The Romance of Oil, John J. Floherty (New York: Lippincott) 1957 (224 pp.; $3.95).

Facts and anecdotes combine in this adventure story of the oil industry.

4) "Natural Gas Energy and the Environment," Newsletter, Vol. 2, No. 1, Educational Services, American Gas Association, 1515 Wilson Blvd., Arlington, Virginia 22209.

This four-page booklet summarizes information about natural gas including its formation, its use as a fuel, and its projected supply with present consumption patterns.

5) The New World of Petroleum, Alfred Lewis (New York: Dodd-Mead) 1966 (80 pp.; $3.50).

The formation of oil and how it is found, the first oil well and uses of petroleum are covered in this book. It is especially useful for its coverage of petrochemicals and by-products of the refining process including plastics, waxes, asphalt, insecticides, fertilizer, detergents, and such fibers as nylon and Dacron.

6) "The Other Shortage," **Time,** January 7, 1974, pp. 40-46.

Notes dwindling supplies of natural gas in the U.S.

7) "Peat — Time to Remember a Forgotten Fuel," Michael Cusack, **Scholastic Science World,** October 31, 1974, Vol. 29, No. 6.

This article explains the formation of peat and its uses for fuel.

IV Electric Power

1) Electricity in Your Life, Irving and Ruth Adler (New York: John Day) 1965 (128 pp.; $3.95).

Using photographs, drawings, and diagrams, this book clearly illustrates the fundamentals and uses of electricity.

2) Electricity in Your Life, Eugene David (Englewood Cliffs, New Jersey: Prentice-Hall) 1963 (79 pp.).

Electricity, current, and motors are explained in this book. Some elementary equations are included.

3) Turned On: A Look at Electricity, A. Harris Stone and Bertram M. Siegel (Englewood Cliffs, New Jersey: Prentice-Hall) 1970 (64 pp.; $3.95).

Scientists and their discoveries about electricity are brought to life in this book. Students duplicate the famous experiments of Gilbert, Davy, Farraday, Ohm, and others. A glossary is included.

V Energy Into Power

1) All About Engines and Power, Sam and Beryl Epstein (New York: Random House) 1962 (144 pp.; $2.95).

A very readable and well-illustrated text presents kinds of energy with a concise but clear discussion of basic physical concepts. In like fashion, energy-using devices are described and explained. Included are turbines, diesel and gasoline engines, electric generators, rockets, and nuclear reactors.

2) "Energy Cheap Cars — At a Price," Malcolm Weiss, **Scholastic Science World,** October 31, 1974, Vol. 29, No. 6.

The energy-saving effects of stratified charge engines are discussed. The article conveys a good sense of the trade-offs in energy saving vs. economy.

3) Energy and Power, L. Sprague deCamp (New York: Golden Press) 1962 (54 pp.; o.p.).

Part of the Golden Library of Knowledge series, this book is subtitled "How Man Uses Animals, Wind, Water, Heat, Electricity, Chemistry, and Atoms to Help Him in His Daily Living." Each of these topics is covered in a short section with color illustrations and cutaway drawings contributing to a very clear presentation of man's uses of energy — past, present, and future.

4) Energy and Power, Albert Hinklebein (New York: Watts) 1971 (123 pp.; $4.95).

A clear text with many illustrations and drawings and an excellent index captures the reader's interest with a description of the 1965 New York power blackout. The text then describes what energy is, and the kinds of energy with specific illustrations and explanations of devices that use energy (such as automobiles) as well as devices that produce power (such as turbines and heat engines).

5) Man and Power: The Story of Power from the Pyramids to the Atomic Age, L. Sprague deCamp (New York: Golden Press) 1961 (189 pp.).

An attractive and extensive treatment of the history of man's use of power and particular power sources, this book is profusely illustrated with photographs, drawings, and paintings.

6) "Powerhouse of the Northwest," David S. Boyer, **National Geographic,** December 1974 (821-847 pp.).

The possibilities and concerns connected with the use of the Columbia River and its powerhouses are examined in this article.

7) The Story of Dams: An Introduction to Hydrology, Peter Farb (Irvington-on-Hudson, New York: Harvey House Books) 1961 (127 pp.; $4.95).

Many black-and-white photographs of different kinds of dams illustrate this interesting book that tells how dams are used to produce hydroelectric power, irrigate land, and prevent floods.

8) The Story of Power, Edward Stoddard (Garden City, New York: Garden City Books) 1956 (63 pp.; o.p.).

A concise text and large black-and-white or color illustrations make this a useful book. Cutaway drawings are especially clear and well marked. Subjects covered range from man-driven waterwheels to solar and atomic power.

VI Energy Supply and Demand

1) "Energy Shortage Strikes Homes," **U.S. News and World Report,** December 10, 1973 (17-19 pp.).

Includes a chart showing "Where America's Energy Goes."

2) "Oil: The Dwindling Treasure," Noel Grove, **National Geographic,** Vol. 145, No. 6, June 1974 (792-825 pp.).

The facts and politics related to world oil supply problems are covered in this article. Several very useful maps and graphs are included.

3) "The Oil That Wasn't There," **Science News,** April 27, 1974, Vol. 105, No. 17 (p. 277).

Changes in the projections of oil and gas reserves are discussed in this article.

4) "The Search for Tomorrow's Power," Kenneth Weaver, **National Geographic,** Vol. 142, No. 5, November 1972 (650-681 pp.).

An excellent summary of the energy supply problem with detailed coverage of the various fossil fuels, nuclear power possibilities, geothermal and solar energy. Excellent charts, explanations, and photographs.

5) "Special Report on Energy," **National Wildlife,** October-November 1974.

Eight pages of graphic summaries of various aspects of the energy problem. Easy-to-read and understand

format covers supply and demand of various fuels, big users of fuels, alternatives, and necessity for energy conservation.

6) "What U.S. Can Do To Tap Energy Sources Closer To Home," **U.S. News and World Report,** December 3, 1973 (46-51 pp.).

Discusses availability of energy sources in U.S. and world with emphasis on oil and shale oil.

VII Nuclear Power

1) Atomic Energy, Irving Adler (New York: John Day) 1971 (47 pp.; $3.69).

There are very brief treatments here of a variety of topics from basic mechanics (muscles and engines and energy to drive engines) to the importance of fossil fuels and their depletable nature. The focus, however, is on atomic energy, and careful explanation is provided of nuclear structure, fission, the workings of a nuclear reactor and the way in which nuclear fuels are prepared. Environmental problems associated with nuclear power are outlined along with a brief history of the discovery of atomic power. Useful illustrations are included throughout, and the text is consistently clear and straightforward with careful attention to vocabulary and the meaning of numbers.

2) Atomic Power for People, Edward and Ruth Shaw Radlauer (Chicago: Melmont) 1960 (60 pp.; o.p.).

This career-related book describes nuclear power plant operation and the people needed to design and run it. Included are photographs of reactors and personnel from scientists and site engineers to technicians

3) Atoms Today and Tomorrow, Margaret O. Hyde and Bruce G. Hyde (New York: McGraw-Hill) 1970 (138 pp.; $4.95).

This is not a text about the basic physics of atomic energy, but an examination of the applications of atomic energy to a variety of peaceful uses: in medicine, and in nuclear reactors for power. A glossary is appended and a number of drawings are included to illustrate the text.

4) How and Why Wonder Book of Atomic Energy, Donald Barr (New York: Grosset and Dunlap) 1961 (48 pp.; $1.50).

The familiar How and Why format, well illustrated with boldface question guides to the topics covered, tells the development of the atomic bomb and the steps taken to learn how to use controlled atomic energy for power. The background section on the basic nature of matter makes this a good source for understanding what energy is as well.

5) The Story of Atomic Energy, Laura Fermi (New York: Random House) 1961 (180 pp.; $2.95).

Laura Fermi's well-known book conveys both the facts and the excitement of discovery in the early work on atomic energy. She also discusses possible future uses of atomic power.

6) The Walt Disney Story of Our Friend the Atom, Heinz Haber (New York: Simon & Schuster) 1956 (165 pp.; o.p.).

A combination of fact and story makes a readable explanation of atomic energy and discoveries about it.

VIII Environmental Effects

1) "Auto Emissions and Health," **Science News,** Vol. 106, No. 11, September 14, 1974, p. 166.

This article presents results of a one-year study of health and cost effects of air pollution. Difficulties of establishing effects and questions of synergystic effects are discussed.

2) "Bare-handed Battle to Cleanse the Bay," Peter T. White, **National Geographic,** Volume 139, Number 6, June 1971, pp. 866-881.

The dramatic story of the efforts of many volunteers to clean up San Francisco Bay and rescue as many birds as possible after an oil spill.

3) Clean Air — Sparkling Water, Dorothy E. Shuttlesworth (New York: Doubleday) 1966 (94 pp.; $4.95).

Photographs and text related to real-life experiences bring home causes of air and water pollution and emphasize the role of people in both causes and solutions.

4) "Coal is Cheap, Hated, Abundant, Filthy, Needed," Jane Stein, **Smithsonian,** Volume 3, Number 11, February 1973, pp. 19-27.

This article details the need for and problems associated with strip mining for coal. Coal gasification is explained. The difficulties both financial and physical of reclamation of strip-mined lands are discussed.

5) "Energy and Environment: What is the Strip-Mining Controversy All About?" 32 pp., Surface Mining Research Library, 1218 Quarrier Street, Charleston, West Virginia 25301.

Pictures in color and black-and-white tell the story of successful and unsuccessful attempts at reclamation of strip-mined lands.

6) Our Dirty Air, Sarah M. Elliott (New York: Messner) 1973 (64 pp.; $3.79).

Photographs graphically show what causes air pollution, how it is harmful, and what can be done about it by both individuals and government.

7) Our Dirty Water, Sarah M. Elliott (New York: Messner) 1973 (65 pp.; $4.79).

Another clear and readable book by the author of the above, includes power plants as sources of pollution. Also mentioned are mine runoff and oil spills, thermal pollution and radioactive wastes from atomic power plants.

8) A Primer on Air Pollution, (free) Mobil Oil Corporation, 150 East 42nd Street, New York, New York 10017.

The causes of air pollution from automobiles, homes, and industry are indicated. Pollution effects from various kinds of fuels are enumerated. Tells some of the things people can do now to help clean up the air.

9) "Strip-mining: Impact on Forest and Wildlife," **Science News 104,** July 21, 1973, p. 37.

A brief summary of some of the effects of strip mining.

10) "Will Oil and Tundra Mix?" William S. Ellis, **National Geographic,** Volume 140, Number 4, October 1971, pp. 485-517.

Discusses plans for development of Alaskan oil fields and possible environmental and social effects.

IX Future Energy Sources

1) Exploring Solar Energy, Raymond A. Wohlrabe (New York: World) 1966 (87 pp.; $2.96).

Mr. Wohlrabe has followed current solar energy projects around the world. He describes various devices that use and test solar energy. Included are solar stoves in India, desalination devices in California, a solar still for producing survival water in desert or ocean, and solar devices used in space probes. Future possibilities are also described including biochemical fuel cells and solar-heated houses. Photographs and drawings or diagrams are plentiful.

2) The First Book of Solar Energy, John Hoke (New York: Franklin Watts) 1968.

There are a lot of good photographs of solar energy devices and experiments here and a wealth of information about the origins of solar energy, the uses to which man can put that energy, the devices used to collect and convert it, and the kinds of things that may be done with solar energy in the future. About 30 word-and-picture pages describe "Things You Can Do With Solar Energy," and a "List of Solar Materials" shows availability and cost of various commercial kits and equipment. An extremely useful presentation for the general science student interested in doing things with solar energy.

3) "Solar Cells: When Will You Plug into Electricity from Sunshine?" John R. Free, **Popular Science,** December 1974, pp. 52-55.

Many photographs and diagrams of current solar cell technology are included in this article.

4) Solar Energy, Franklyn M. Branley (New York: Crowell) 1957 (117 pp.; $3.95).

The sun's energy is explained; present and possible future uses are described. Drawings of solar devices are included, as are directions for simple experiments.

5) "Turning on the Sun Power," **Newsweek,** July 16, 1973, pp. 78-79.

Describes solar power used in an experimental house at the University of Delaware.

6) "Your Life Depends on the Sun," **National Wildlife,** Volume 9, Number 6, October-November 1971, pp. 10-11.

Describes the sun's energy flow through the environment.

7) "Fire Down Below: Geothermal Energy," **Newsweek,** February 19, 1973, p. 72.

This short article on possibilities of using natural steam for power mentions some of the possible environmental effects and includes a map of potential world sources of geothermal power.

8) "Geothermal Energy: The Power Under Our Feet," Ron Davids, **Science Digest,** July 1974, pp. 10-15.

An excellent article on geothermal power sources: how earth steam and heat can be used for power and the question of effects.

9) "Geothermal Energy ... the Prospects Get Hotter," John F. Henahan, **Popular Science,** November 1974.

A fairly technical, but informative article summarizing some attempts currently being made in the U.S. to harness geothermal energy.

10) Coal Gasification, Channing L. Bete, 45 Federal Street, Greenfield, Massachusetts 01301.

Graphs and cartoons enhance this clear summary of the need for and technique of coal gasification.

11) "New Coal Technology, the Cinderella Fuel Comes Out of the Cellar," **Popular Science 204:** 82-85, March 1974.

The coal gasification process and the potential for this new use of coal are outlined here.

12) The Oceans in Tomorrow's World: How Can We Use and Protect Them? David Rueben Michaelson (New York: Messner) 1972 (189 pp.; $4.79).

This book contains a section titled "Power from the Sea" which presents some of the possibilities of using the sea as a power source. Topics covered are tidal power, steam power from the sea, and fusion.

13) "Interest in Wind is Picking Up as Fuels Dwindle," Wilson Clark, **Smithsonian 4:** 70-78, November 1973.

This beautifully illustrated article conveys the excitement of the potential for windmills. Coverage includes: new windmill technology, ongoing research and new spheres for large-scale use.

14) The Windmill Yesterday and Today, R.J. DeLittle (London, John Baker) 1972.

The history and workings of windmills are told here, illustrated with excellent and numerous black-and-white photographs.

15) "Ocean Energy: New Life For an Old Idea," **Science News,** June 15, 1974, Vol. 105, No. 24, p. 281.

Discusses the use of temperature differences in the ocean to produce power.

16) "Trash," **Science News,** March 30, 1974, Vol. 105, No. 1, p. 212.

Presents St. Louis, Missouri's, plans to use solid wastes to generate electricity.

X Energy Conservation

1) "A Cool Solution For an Energy Problem," **Science News,** June 29, 1974, p. 414.

Discusses how proposed new designs in refrigerators would make them more efficient.

2) Man and His Resources in Today's World, C.W. Mattison (Mankato, Minnesota: Creative Educational Society) 1967 (approx. 150 pp.; $6.95).

This well-illustrated book on man's resources includes chapters on minerals and future power sources.

There is a conservation emphasis, and air and water pollution are also discussed.

3) "Must This Land Die?" **Outdoor Life,** 152: 47-9, August 1973.

Concerns about strip mining in the game-rich Powder River Basin are raised in this article.

4) A Place In the Sun, Lois and Louis Darling (New York: Morrow) 1968 (68 pp.; $4.95).

This book presents very useful and clear discussions and diagrams of ecosystems and natural cycles. It also shows how pollution interrupts these cycles. A final section deals with present and potential recycling measures.

Additional Sources

Energy conservation is also covered in many references in other sections. The following are free or low cost materials on energy conservation. Most of them offer checklists or suggestions for saving energy at home, at work, or in transportation.

1) A Consumers Guide to Effective Energy Use in the Home (free) American Petroleum Institute, 1801 K Street, N.W., Washington, D.C. 20006.

2) Eco-tips #5: Energy Conservation, Concern Inc., 2233 Wisconsin Avenue, N.W., Washington, D.C. 20007.

3) Electricity: How to Get the Most for the Least, 16 pp., Potomac Electric Power Company, 1900 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

4.) Energy Conservation: Experiments You Can Do, Thomas Alva Edison Foundation, Cambridge Office Plaza, Suite 143, 18280 West Ten Mile Road, Southfield, Michigan 48075.

5) The Energy Crisis, What You Can Do About It, Youth and Educational Activities, Standard Oil Company (Indiana), Mail Code 3705, 200 E. Randolph Drive, Chicago, Illinois 60601.

6) Energy Options — "Study on Energy Options," and wall chart: "Energy Options for Man," free with self-addressed envelope, Energy Options, EEG/EAG, 1543 N. Martle Avenue, Los Angeles, California 90046.

7) "How to Save Fuel," **U.S. News and World Report,** December 17, 1973.

8) One Answer to the Energy Crisis, American Petroleum Institute, 1801 K Street, N.W., Washington, D.C. 20006.

9) Watts Going on Where You Live? (50 copies at 10 cents each) General Electric Company, P.O. Box 500, New Concord, Ohio 43762.

10) What an Individual Can Do to Lessen the Strain on the Environment, Susan Anderson, Ecology Information Center, Sacramento, California 95814.

11) The Energy Challenge: What Can We Do? Conoco, Department C06, GPO Box 29, New York, New York 10001.

XI) Energy Policy

1) "The Oil Crisis: A Whodunit For the Great Holmes," **Science News,** Vol. 105, January 19, 1974, pp. 36-37.

An analysis of the economics and politics of the oil crisis.

2) "Over the Mid-east Oil Barrel," **Newsweek,** Vol. 82, No. 4, July 23, 1973, pp. 59-62.

Presents political consequences of world oil distribution. Includes chart on estimated world oil reserves.

3) "Man's Age-old Struggle For Power," A. Hardy, **Natural History: 82,** 82-86, October 1973.

4) "Unsheathing the Political Weapon," **Time,** October 29, 1973, pp. 46-51.

The Arab world's changing attitude toward its oil resources. Includes a chart contrasting U.S. oil imports in 1962 and 1972.

PART IV
Readings for Students
(Grades K-6)

ENERGY-ENVIRONMENT MATERIALS GUIDE

Part IV

Additional materials are available in encyclopedias and yearbooks. A suggested list of subject terms for searching these sources has been included in Appendix E2.

SUGGESTED READINGS FOR STUDENTS: GRADES K-6

An annotated bibliography of books and articles for students (Grades K-6).

I Basic General References

1) The Curious Naturalist, Massachusetts Audubon Society, Lincoln, Massachusetts 01773 ($3.50 per year).

Grade Level 3-5

This conservation magazine has published a series of articles on energy in 1974. They also can provide a bi-monthly teachers guide that suggests projects in addition to those listed in the magazine. Articles done so far this year include: entire issue on food energy, September 1974; "Keeping a Transportation Energy Journal," October 1974; "Homes Tell A Story" and "Heat Conservation Journal," November 1974. Additional articles are planned for 1975.

2) Energy and Environment, Norman F. Smith (Austin, Texas: Stech-Vaughn) 1974 (48 pp.; $3.95).

Grade Level 4-6

Energy sources and their uses are presented here as well as pollution problems associated with particular sources. Energy supply and demand are discussed and questions are asked about energy uses by individuals and society. Questions for the student to ask about energy use in his home and community are listed at the end.

3) Fuel for Today and for Tomorrow, R.J. Lefkowitz, John E. Johnson, illus. (New York: Parents' Magazine Press) 1974 (64 pp.; $4.59).

Grade Level 3-5

Colorful drawings and a straightforward text cover the full range of energy-environment topics. Starting with fuels as what makes everything go, the book covers fossil and future fuels, pollution effects of various power sources, and the need for energy choices and conservation.

4) Why Things Work: A Book About Energy, Jeanne Bendick (New York: Parents' Magazine Press) 1972 (63 pp.; $3.97).

Grade Level 3-5

Presents physical concepts about energy including changes from one form to another and energy uses by machines. Explains the need for conservation in terms of energy loss.

II Energy Fundamentals

1) Energy, Irving Adler (New York: Day) 1970 (47 pp.; $4.47).

Grade Level 4-6

Basic physical concepts are treated in separate sections. Topics include: forms of energy, circulation and transportation of energy, energy from fuels and the sun, and nuclear energy.

2) The First Book of Energy, George Russell Harrison (New York: Watts) 1965 (81 pp.; $3.45).

Grade Level 4-6

A basic explanation of energy principles includes kinds of energy, energy sources, and storage and handling problems. An index and glossary add to the usefulness of the text.

3) Things Are Made To Move, Illa Podendorf (Chicago: Children's Press) 1970 (48 pp.; $5.25).

Grade Level 1-3

Kinds of energy are explained in this book using familiar toys and vehicles as examples.

4) The True Book of Energy, Illa Podendorf (Chicago: Children's Press) 1971 (47 pp.; $4.50).

Grade Level 3-5

The importance of energy and the kinds of energy are related to children's own experiences in this book. There are short sections with many illustrations and brief text on: "Our Energy," "Wind Energy," "Electrical Energy," "Magnetic Energy," "Heat Energy," "Sun Energy," "Chemical Energy," and "Mechanical Energy."

5) The World of Push and Pull, Earl Ubell (New York: Atheneum) 1964 (58 pp.; $3.07).

Grade Level 4-6

This introduction to the laws of mechanics includes energy principles. Black-and-white photographs of children engaged in activities that illustrate the physical principles described in the text make this book particularly interesting and easy to understand.

III Energy Resources

1) Coal, Irving and Ruth Adler (New York: John Day) 1965 (47 pp.; $3.96).

Grade Level 3-5

Following the usual "Reason Why" format, this book tells in short sections the history of mining, uses of coal, modern mining practices, modern coal uses and by-products, and environmental effects from coal retrieval and use.

2) The First Book of Mining, Patricia Maloney Markum (New York: Watts) 1959 (69 pp.; $2.95).

Grade Level 4-7

The history of mining from Roman times to the present is very clearly and interestingly told in this book. Diagrams make clear the basic problems that men have had to deal with in underground mines from the earliest days of mining to the present. Modern mining techniques are also presented.

3) Let's Visit an Electric Company and **Let's Visit an Oil Company,** Billy N. Pope and Ramona Ware

Emmons (Dallas: Taylor Publishing Co.) (approximately 32 pp. each; $3.00).
Grade Level K-3

Large, colored photographs and controlled vocabulary show a group of children tracing the power lines from a house to the power company. In **Let's Visit an Oil Company** the children are seen visiting an oil refinery and tracing the oil from refinery to automobile.

4) Natural Gas Serves Our Community, American Gas Association, 1515 Wilson Blvd., Arlington, Virginia 22209.
Grade Level 3-5

This free booklet describes what natural gas is, how it was formed, and how it is found, stored, and used.

5) Oil: Today's Black Magic, Walter Buehr (New York: Morrow) 1957 (96 pp.; $4.32).
Grade Level 4-6

Informative illustrations enhance this history of the production and uses of petroleum.

6) The Picture Book of Oil, Anita Brooks (New York: John Day) 1965 (95 pp.; $4.68).
Grade Level 3-5

Black-and-white photographs emphasize the different talents and people needed to discover, recover, and refine oil. World coverage of the photographs adds to the international sense of the book.

7) Rock Oil to Rockets: The Story of Petroleum in America, Dirk Gringhuis (New York: Macmillan) 1960 (28 pp.; o.p.).
Grade Level 4-6

A fascinating telling of the uses of and discoveries about petroleum from Indian medicine to rocket propulsion. Told in story form, there is plenty of human interest in the men and their inventiveness in the discovery and recovery of this "black gold."

8) Underground Riches: The Story of Mining, Walter Buehr (New York: Morrow) 1958 (95 pp.; $4.32).
Grade Level 4-6

With excellent drawings this book tells the history of mining and its dangers and difficulties. Present-day mining techniques are illustrated, and there is a separate section on coal mining.

IV Electric Power

1) Electricity, Ben Kerner (New York: Coward-McCann) 1965 (approximately 30 pp.).
Grade Level 3-4

Humorous illustrations and text explain the discovery of electricity, static and current electricity, and batteries and power plants.

2) The First Book of Electricity, Sam and Beryl Epstein (New York: Watts) 1953 (68 pp.; $2.65).
Grade Level 4-6

This very clear and well-illustrated book suggests acting-out activities to convey such concepts as current and a circuit. Experiments with simple materials are suggested and excellent cross-sectional diagrams are given of simple electrical devices such as light bulbs, plugs, and sockets.

3) Let's Go to A Dam, Lee David Hamilton (New York: Putnam) 1963 (47 pp.; $1.86).
Grade Level 3-5

The multipurpose nature of dams is explained here including the production of hydroelectric power. The work of turbines, generators, switching stations, and transformers is also explained and illustrated.

4) The Story of Electricity, Mae and Ira Freeman (New York: Random House) 1961 (79 pp.; $2.95).
Grade Level 3-5

This easy-to-read book explains clearly and in simple language the physics of electricity then moves to some devices that use electricity including electric motors, power stations, the telephone, radio, and television.

5) The True Book of Rivers, Norman and Madelyn Carlisle (Chicago: Children's Press) 1967 (47 pp.; $4.50).
Grade Level 2-4

This book contains an especially clear diagram of a dam and its electricity producing facilities.

6) What Makes the Light Go On? Scott Corbett (Boston: Little, Brown) 1966 (56 pp.; $3.50).
Grade Level 3-5

This basic book on electricity for younger readers discusses atomic structure, magnetism, and electric current using humorous drawings and a readable text. Also explained are the workings of a flashlight, a light bulb, and electric generators.

7) What Happens When You Turn On the Light? Arthur Shay (Chicago: Reilly and Lee) 1972 (unpaged; $4.50).
Grade Level 3-5

Large black-and-white photographs tell about the hidden world behind our lights. Included are turbines, power stations, and dams.

V Energy Into Power

1) Energy and Power, Robert Irving (New York: Knopf) 1958 (140 pp.; $2.75).
Grade Level 4-6

Starting from a definition of work this book presents basic principles and definitions with frequent examples and pen-and-ink drawings. The book builds from man's use of his muscles to various devices for increasing his strength. Included are: wind and water power, motion from heat, electrical power, atomic power, and possible future energy sources.

2) Engines, L. Sprague deCamp (New York: Golden Press) 1959 (56 pp.; o.p.).
Grade Level 4-6

This well-illustrated book about engines uses short sections with color diagrams to describe the operation

of steam, diesel, and internal combustion engines, gas turbines, electric motors and generators, and atomic engines.

3) Engines, Paul Roberson (New York: John Day) 1965 (48 pp.; $3.96).
Grade Level 4-6

Clear text and colorful illustrations combine with useful cutaway diagrams to explain steam engines and turbines, internal combustion engines, gas turbines, and jet and rocket engines.

4) Engines, Atoms, and Power, Anabel Williams-Ellis (New York: Putnam) 1958 (64 pp.; $2.00).
Grade Level 4-6

Readers learn about engines, atoms, and power by seeing how discoveries about them were made and have been applied and used. Benjamin Franklin, James Watt, Michael Faraday, and the Curies and their discoveries are presented in short, independent sections.

5) More Power to You: A Short History of Power from the Windmill to the Atom, Nina Schneider (New York: Scott) 1953 (120 pp.; $3.95).
Grade Level 3-6

Energy applications are discussed in short sections using historical development as a framework. Various power sources are covered starting with windmills through steam and electricity and going up to atomic and solar power. There are many simple experiments to illustrate the various power sources. Clear drawings illustrate devices from windmills and water mills to rockets.

VI Supply and Demand
(See III, Energy Resources.)

VII Nuclear Power

1) About Atoms for Junior, Les Landin (Chicago: Melmont) 1961 (31 pp.; $3.25).
Grade Level 2-4

Humorous cartoons illustrate this book that explains very clearly about atoms, molecules, and heat. There are especially good descriptions of relative size such as "If you could blow up a balloon so that each of its atoms was one inch wide, the balloon would be larger than the earth."

2) Let's Go To An Atomic Energy Town, Kirk Polking (New York: Putnam) 1968 (46 pp.; $2.29).
Grade Level 3-5

The reader visits a hypothetical city run on atomic power. Beneficial uses of radioactive materials are mentioned with little said about hazards — an optimistic picture.

3) The Story of the Atom, Mae and Ira Freeman (New York: Random House) 1960 (81 pp.; $2.95).
Grade Level 4-6

In a clear text with simple drawings this Easy Reader Book explains atoms and molecules and tells how we know about them. Radiation, radioisotopes, cyclotrons, and atomic power plants are also discussed.

VIII Environmental Effects

1) The Air We Live In, James Marshall (New York: Coward-McCann) 1968 (94 pp.; $4.49).
Grade Level 5-6

A part of the New Conservation Series this book emphasizes man's role in producing and preventing air pollution. The causes of air pollution are illustrated with black-and-white photographs.

2) Professor Clean Asks What Is Air Pollution? 1973, free, General Motors Corporation, Detroit, Michigan 48202.
Grade Level 1-4

This booklet illustrated with children's drawings, tells some of the causes of air pollution and what part cars play in that pollution. The treatment is clear and colorful.

3) Clean Air, Beulah Tannenbaum and Myra Stillman (New York: McGraw-Hill) 1973 (64 pp.; $4.50).
Grade Level 3-5

Discusses municipal, industrial, and individual contributions to air pollution, its harmful effects, and the progress made in cleaning up city air.

4) Clean Streets, Clean Water, Clean Air, Cynthis Chapin (Chicago: Whitman) 1970 (30 pp.; $3.25).
Grade Level 1-3

A beginning book explaining the need for pollution control and some of the people and devices presently used to accomplish it. Efforts of individuals as well as governments are stressed.

IX Future Energy Sources

1) Thank You Mr. Sun, Hyman Ruchlis (Irvington-on-Hudson, New York: Harvey House) 1957 (45 pp.; $3.95)
Grade Level 2-4

A good background book for younger readers which should prepare them for later understanding of the sun and energy. Topics discussed include: the sun's role in food, water, oxygen, and heat production. The book explains well the sun's role in the production of fossil fuels.

2) Waves, Herbert Zim (New York: William Morrow) 1967 (64 pp.; $2.94).
Grade Level 3-5

This is an excellent background book for later understanding of the potential power of the waves and ocean. Black-and-white drawings are very clear and dramatic.

X Energy Conservation*

1) "How to Conserve Energy at Home," Channing L. Bete, 45 Federal Street, Greenfield, Massachusetts 01301.

*Many of the best materials for elementary school readers are available from local power and gas companies. These often include booklets such as those above and materials in comic book format. See also the Conservation section of the Reading List for Grades 5-9 for sources of checklists of energy-saving suggestions.

Grade Level 4-up

One of this publisher's many attractive and readable booklets. Presentation is clear and graphic with cartoon characters and useful pie graphs. Other titles on energy topics included in this series are: "32 Ways You Can Fight Pollution," "Energy Crisis," "A-B-C's of Electricity," and "About Coal Gasification."

2) Man and His Resources in Today's World, C.W. Mattison (Mankato, Minnesota: Creative Educational Society) 1967 (150 pp.; $6.95).

Grade Level 4-6

This well-illustrated book on man's resources includes chapters on minerals and future power resources. There is a conservation emphasis, and air and water pollution are also discussed.

APPENDICES

APPENDIX A

A Guide to Films and Audio-Visual Materials

I Basic General References

Energy, 20 minutes, 16mm, and **Flames and Energy,** 35mm, 37 fr. filmstrip (free). American Gas Association Film Library, 1515 Wilson Boulevard, Arlington, Virginia 22209.
Grade Level 7-12

Energy and All That, 27½ minutes, color, free loan. American Petroleum Institute. Available: Modern Talking Picture Service, 2323 New Hyde Park Road, New Hyde Park, New York 11040.
Grade Level 7-12

Energy, Energy to Burn, and **Tragedy of the Commons,** BFA Educational Media, 2211 Michigan Avenue, Santa Monica, California 90404.
Grade Level 7-12

The Dilemma, Nuclear Alternatives, New Sources, Less is More, Churchill Films, 66252 North Robertson Boulevard, Los Angeles, California 90069.
Grade Level 7-12

Energy and Our Environment, filmstrip series S290, four filmstrips with records or cassettes (to be released January-February 1975). Coronet Instructional Media, 65 East South Water Street, Chicago, Illinois 60601.
Grade Level 5-9

Energy and the Environment, 4-color sound filmstrips, 12-15 minutes each with 32-page teachers manual. Macmillan Library Service, 202B Brown Street, Riverside, New Jersey 08075.
Grade Level 6-12

Energy Crisis Series: Environment, Power, Coal, Natural Gas, Future Fuels. NBC Educational Enterprises, 30 Rockefeller Plaza, New York, New York 10020.
Grade Level 9-12

The Fuel Crisis (background and prospects) and **The Power and Energy Crisis** (explains energy and power generation). Scott Education Division, 104 Lower Westfield Road, Holyoke, Massachusetts 01040.
Grade Level 6-12

When the Circuit Breaks, 28 minutes, 16mm, color. Free loan from Modern Talking Pictures Service, 2000 N Street, N.W., Washington, D.C. 20036.
Grade Level 9-up

Federal Energy Administration film explains how America's energy problems happened and how we can meet their challenges. It focuses on our need to develop resources and investigates the promise of geothermal, nuclear fusion, and solar energy as future energy sources.

II Energy Fundamentals

Energy: A First Film, 8 minutes, color, sound. BFA Educational Media, 2211 Michigan Avenue, Santa Monica, California 90404.
Grade Level K-3
Covers kinds of energy and uses of energy.

Energy: Ability to do Work, 9 minutes, color, sound. AIMS Instructional Media Services, P.O. Box 1010, Hollywood, California 90028.
Grade Level 2-8

Energy and Its Forms, 10 minutes, black-and-white, sound. Coronet Instruction Films, 65 East South Water Street, Chicago, Illinois 60601.
Grade Level 7-12
Defines energy and presents examples.

Energy and Its Transformations, Encyclopedia Britannica Films Inc., 1150 Wilmette Avenue, Chicago, Illinois 60091.
Grade Level 7-up

Energy and Life, 20 minutes, color, sound. Modern Learning Aids, Division of Wards Natural Science, P.O. Box 302, Rochester, New York 14603.
Grade Level 8-college
Introduces basic physical laws, energy transfer among organisms.

Energy and Matter, 9 minutes, color. McGraw-Hill Film Division, 330 West 42nd Street, New York, New York 10036. Introduction to energy concepts.
Grade Level 4-8

Energy Into Work, 20 minutes, black-and-white, sound. Peter M. Roebuck and Co., 230 Park Avenue, New York, New York 10017.
Grade Level 2-8

Energy Uses Series, sound filmstrips. Society for Visual Education, 1345 Parkway, Chicago, Illinois 60614.
Introduction to Heat, 12 minutes, $9.00.
Introduction to Light, 13 minutes, $9.00.
Introduction to Matter and Energy, 13 minutes, color, $34.25.
Introduction to Simple Machines, 12 minutes, $9.00.
Grade Level 2-6

Sun's Energy Cycle, Peter M. Roebuck, 230 Park Avenue, New York, New York 10017.
Grade Level 2-6

III Energy Resources: Supply and Demand

Coal, 27 minutes, 16mm, color, $330 or $30 rental. NBC Educational Enterprises, 30 Rockefeller Plaza, New York, New York 10020.
Grade Level 9-12

Crude Oil for Energy, film, and **Refining Oil for Energy,** filmstrip. Shell Oil Company, 50 West 50th Street, New York, New York 10020.
Grade Level 7-up

The Energy Crunch, Philadelphia Electric Co., Director of Community Relations, 2301 Market Street, Philadelphia, Pennsylvania 19101.
Grade Level 9-12

Energy Sources. BFA Educational Media, 2211 Michigan Avenue, Santa Monica, California 90404.

Grade Level 7-up

A series of filmstrips on the various energy sources.

Energy — Toward the Age of Abundance, 22 minutes, 16mm, color, sound. University of California Extension Media Center, Berkeley, California 94720.

Grade Level 9-12

Presents U.S. energy use in a world perspective and possible new energy sources.

The Great Search, 13 minutes, 16mm, color. Walt Disney Educational Materials, 360 South Buena Vista Avenue, Burbank, California 91503.

Grade Level 7-up

An optimistic view of man's chances of finding new energy sources.

How We Get Our Coal, How We Get Our Oil, and **How We Get Our Gas,** filmstrips. Young America Films, McGraw-Hill, 327 West 41st Street, New York, New York 10036.

Grade Level 4-8

The Leading Edge, 27 minutes, color. Modern Talking Picture Service, 315 Springfield Avenue, Summit, New Jersey 07901.

Grade Level 9-12

Man's Search for Energy, filmstrip, $6.75. McGraw-Hill Films, 330 West 42nd Street, New York, New York 10018.

Grade Level 3-7

Natural Gas, 17 minutes, 16mm, color, $240 or $20 rental. NBC Educational Enterprises, 30 Rockefeller Plaza, New York, New York 10020.

Grade Level 9-12

Oil in the Mid-East and **Oil in the U.S.,** 16mm color films. NBC Energy Crisis Series. NBC Educational Enterprises, 30 Rockefeller Plaza. New York, New York 10020.

Grade Level 9-12

Our Minerals and Energy Resources, filmstrip, sound, $10.00. Coronet Films, 65 East South Water Street, Chicago, Illinois 60601.

Grade Level 4-9

Sources of Energy, filmstrip, 40 fr., $11.00. Popular Science Publishing Co., 355 Lexington Avenue, New York, New York 10017.

Grade Level 9-12

The World of Energy. National Geographic Society, Department 1037, Washington, D.C. 20036.

Grade Level 9-12

Six filmstrips illustrate known and potential energy sources.

World's Energy Supply, filmstrip, color, 37 fr., $8.50. McGraw-Hill Films, 330 West 42nd Street, New York, New York 10018.

Grade Level 9-12

IV Electric Power

Electricity — All About Us, 11 minutes, color. Coronet Films, 65 East South Water Street, Chicago, Illinois 60601.

Grade Level 3-6

Teaches characteristics and importance of electricity by following a child's observations and experiments.

Electricity and How it is Made, 16 minutes, color. Encyclopedia Britannica Films, 1150 Wilmette Avenue, Chicago, Illinois 60091.

Grade Level 1-4

How electricity is used for light, heat, sound and power.

Using Electrical Energy, sound filmstrip, $14.00. Curriculum Materials Corporation, 1319 Vine Street, Philadelphia, Pennsylvania 19107.

Grade Level 4-9

Electricity: Wires in Your Home, 11 minutes, sound, color. AIMS Instructional Media Services, P.O. Box 1010, Hollywood, California 90028.

Grade Level 3-7

A behind-the-walls look at wires in the home. The film follows power poles to a generating station and includes an explanation of electricity and how it works.

V Energy Into Power

Energy, 16mm, color, sound, 12 minutes. Pyramid Films, P.O. Box 1048, Santa Monica, California 90406.

Grade Level 7-12

Power systems and how they transform energy. Power systems of the past, present, and future.

Energy and Power: A First Look, 10 minutes, 16mm ($1,200.00 or rental). Journal Films, 909 West Diversey Parkway, Chicago, Illinois 60610.

Grade Level 2-5

Energy to Burn, 20 minutes, sound, color. BFA Educational Media, 2211 Michigan Avenue, Santa Monica, California 90404.

Grade Level 3-12

Machines Help, 20 minutes ($125.00 or rental). Peter M. Roebuck, 230 Park Avenue, New York, New York 10017.

Grade Level 2-5

Power (part of NBC Energy Film series), 19 minutes, color ($240 or rent $20). NBC Educational Enterprises, 30 Rockefeller Plaza, New York, New York 10020.

Grade Level 9-12

Powerline: Transportation of Energy, Arthur Barr, Box 7-C, Pasadena, California 91104.

Grade Level 4-9

Story of Engines and Energy, filmstrip ($6.00) Curriculum Materials Corporation, 1319 Vine Street, Philadelphia, Pennsylvania 19107.

Grade Level 6-9

The Story of Power, 3 minutes, 16mm ($40.00) 1969, Av-Ed Films, 7934 Santa Monica Boulevard, Hollywood, California 90046.
Grade Level 3-5

Work, Energy and Power, 23 minutes, 16mm, Institutional Cinema, 29 East 10th Street, New York, New York 10003.
Grade Level 7-up

VI Supply and Demand
(See III, Energy Resources.)

VII Atomic Power

Atomic Power Production, 14 minutes, color. Handel Film Corporation, 8730 Sunset Boulevard, Los Angeles, California 90069.
Grade Level 5-9
This animated film presents the need for electrical power, the harnessing of nuclear energy, and kinds of reactors.

Our Friend the Atom, film. Walt Disney Productions, 350 South Buena Vista Avenue, Burbank, California 91503.
Grade Level 4-9

Principles of Thermal, Fast and Breeder Reactors, 9 minutes, color. Office of Public Affairs, USERDA, Washington, D.C. 20545.
Grade Level 9-12

Releasing Atomic Energy, filmstrip, sound, $14.00. Curriculum Materials Corporation, 1319 Vine Street, Philadelphia, Pennsylvania 19107.
Grade Level 5-9
See also extensive ERDA film bibliographies. USERDA Film Library, Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830.

VIII Environmental Effects

The American Dream is Running Out of Fuel, 18 minutes, color, $230 or rent $19. Encyclopedia Britannica Films, Inc., 1150 Wilmette, Illinois 60091.
Grade Level 6-12

Earth: The Years of Decision, 35mm, filmstrip with phono disc and teachers guide. Lyceum Productions, Box 1226, Laguna Beach, California 92652.
Grade Level 6-12

Flames and Energy, 35mm 37 fr. filmstrip. Educational Services, American Gas Association, 1515 Wilson Boulevard, Arlington, Virginia 22209.
Grade Level 7-12

Effects of Air Pollution and **Control of Air Pollution,** 16mm films. Communicable Disease Center, Public Health Service, Atlanta, Georgia 30304.
Grade Level 4-9

Pollution, sound filmstrip series S198 includes 6 filmstrips with records or cassettes. Coronet Films Media, 65 East South Water Street, Chicago, Illinois 60601.
Grade Level 4-9
Discusses causes and effects of pollution.

Science, Energy Environment — Ark., 20 minutes, color. Arthur Barr, Box 7-C, Pasadena, California 91104.
Grade Level 5-12

Sources of Air Pollution, filmstrip. United States Public Health Service Welfare Building, 4th Street and Independence Avenue, S.W., Washington, D.C. 20201.
Grade Level 9-12

Strip Mine Trip, 11 minutes, 16mm, color. Churchill Films, 662 North Robertson Boulevard, Los Angeles, California 90025.
Grade Level 7-12

IX Future Energy Sources

Electricity from Heat and Sunlight, film loop, color with teachers guide, $23.50. Doubleday Multimedia, 1370 Reynolds Avenue, Santa Ana, California 92705.
Grade Level 4-12

Energy from the Sun, filmstrip, color, 36 fr., $6.75. McGraw-Hill Films, 330 West 42nd Street, New York, New York 10018.
Grade Level 4-9

Future Fuels, 17 minutes, 16mm, color, $240 or rent $20. NBC Educational Enterprises, 30 Rockefeller Plaza, New York, New York 10020.
Grade Level 9-12

Harnessing Solar Energy, filmstrip, 40 fr., $6.00. Popular Science Publishing Co., 355 Lexington Avenue, New York, New York 10017.
Grade Level 9-12

How Clear the Hot Springs Bubble, 13 minutes, 16mm, color, sound. International Film Bureau, Inc., 332 South Michigan Avenue, Chicago, Illinois 60604.
Grade Level 7-12

Overview of Energy Sources, 28 minutes, 30 seconds, 16mm, color, is the introductory film of a nine-part series on alternative sources of energy produced by the University of Colorado, Boulder. For information, write Robert de Kieffer, Associate Dean, Continuing Education, University of Colorado, Boulder, Colorado 80302.
Grade Level 7-up
Each of the films in the series may be used independently and includes a study guide and teacher manual. Open-ended, they provide good basis for discussion. Specifications as for the Overview; titles are:

Oil Shale as an Energy Source
Coal as an Energy Source
Geothermal Energy as a Source of Power
Gas Stimulation by Atomic Fracturing as an Energy Source
Nuclear Energy as an Energy Source
Solar Energy as an Energy Source
Wind as an Energy Source
Tar Sands as an Energy Source

Our Mr. Sun, 60 minutes, color. American Telephone and Telegraph Co., Information Department, 195 Broadway, New York, New York 10007.

Grade Level 4-12
Part I — The sun as ancient man saw it.
Part II — Efforts to harness the sun's energy.

Power Sources of the Future, filmstrip, 40 fr., $6.00. Popular Science Publishing Co., 355 Lexington Avenue, New York, New York 10017.
Grade Level 9-12

Solar Storehouse: Light, Heat, and Power, filmstrip, 38 fr., $6.00. Moody Institute of Science, 12000 East Washington Boulevard, Whittier, California 90606.
Grade Level 4-9

The Sun's Energy, 4 minutes, 8mm loop, color, $15.00. Cenco Educational Aids, 1700 Irving Park Road, Chicago, Illinois 60613.
Grade Level 4-9

The Sun's Energy, 14 minutes, filmstrip, 40 fr., color with cassette or record. H.M. Stone Productions, 6 East 45th Street, New York, New York 10017.
Grade Level 9-12

Tidal Power, 22 minutes, 16mm. National Audiovisual Center, Washington, D.C. 20409, Attn: Sales Branch.
Grade Level 7-12

Time to Live, 29 minutes, color. New Jersey State Museum Film Loan Service, Trenton, New Jersey 08625.
Grade Level 9-12

X Energy Conservation

Conserving Our Mineral Resources Today, 11 minutes, film, color. Coronet Films, 65 East South Water Street, Chicago, Illinois 60601.
Grade Level 4-9

Darkness for Our Cities, audio tape. Center for Cassette Studies, Inc., 8110 Webb Avenue, North Hollywood, California 91605.
Grade Level 7-up

King Zog and the Energy Crunch, 19 minutes, 16mm. How to conserve cooling energy is taught by a cast of puppets; companion "hints" folder available. Free loan from Association-Sterling Films, 866 Third Avenue, New York, New York 10022.
Grade Level 7-up

Less is More. Churchill Films, 662 North Robertson Boulevard, Los Angeles, California 90025.
Grade Level 7-12

See also Energy Resources Supply and Demand Section.

XI Energy Policy

Energy: A Dialogue, audio tapes. AAAS Department E1, 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.
Grade Level 9-12
Twelve tapes of interviews with people knowledgeable about the energy crisis.

Energy: A Matter of Choices, 22 minutes, color, Encyclopedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611.
Grade Level 7-12
An overview of sources, attitudes, and consumption of energy.

Energy and the Earth, filmstrip plus cassettes or records. Lyceum Productions, Box 1226, Laguna Beach, California 92652.
Grade Level 7-12
Part I — Earth the Early Years to 1900.
Part II — Earth the Years of Decision — since 1900 (includes teachers guide)

Energy-Environment Game, decision-making simulation game, $20. Dr. Richard B. Scheetz, Coordinator, Educational Services, Edison Electric Institute, 90 Park Avenue, New York, New York 10016.
Grade Level 7-12
Students gather information in the process of role-playing and decision-making about a proposed power plant.

A Thousand Suns, 9 minutes, color. Gilbert Film Associates, Seattle, Washington 98105.
Grade Level K-12
Attempts to build awareness of problem and develop the concept of an energy ethic.

APPENDIX B

A Guide to Energy/Environment Curriculum Materials

Energy Curriculum Materials: State and Local Departments of Education

Source	Grade Level	Background Material for Teachers	Activities	Charts Graphs	Bibliographies
Colorado					
A Teacher's Handbook on Energy Stanley A. Leftwich Office of Field Services Colorado Department of Education Denver, Colorado 80203		X	and checklists	X and illustrations	X/Teacher
Florida					
Teachers Environmental Resource Unit: Energy and Power Environmental Education Program Brevard County School Board Titusville, Florida 32780		X	part of broad spectrum environmental education program		
The Energy Crisis Lee County Environmental Education Program 2266 Second Street Fort Myers, Florida 33901	4 6 6 6		five-lesson unit energy conservation five-lesson unit language arts energy crisis five-lesson unit social studies energy crisis (tech.)	transparencies	
Energy and Us With Florida Power and Light Company	3		field trip activity guide	charts	
Iowa					
Energy Materials Robert Benton Superintendent of Public Instruction Des Moines, Iowa 50319	K-12	Article reprint	X		Teacher, Student, Film, Curricula
Kansas					
Energy Topeka Public & Parochial Schools 1601 Van Buren Topeka, Kansas 66612	Upper elem.	Short articles on activity topics	Self-contained teaching units	X	

Source	Grade Level	Background Material for Teachers	Activities	Charts Graphs	Bibliographies
Energy and You Topeka Public & Parochial Schools 1601 Van Buren Topeka, Kansas 66612	educ. M.R.		Self-contained teaching units	X	
Michigan					
Energy Conservation-Guidelines for Action, 1974 50¢ each from: Region Nine Superintendent Michigan Association of School Administration 421 West Kalamazoo Street Lansing, Michigan 48933	K-12	Curriculum guidelines Teacher background	Sample activities used in Michigan schools		X
GREEP on Energy Project S.E.E. Wyandotte Public Schools 891 Goddard Road Wyandotte, Michigan 48192	K-12		Mini-units designed by students to be taught to other students with teacher as facilitator		
New Jersey					
"Energy Crisis: A Teacher's Resource Guide" **NJEA Review 47:33-44,** February 1974 and reprints from: New Jersey Department of Education State Council for Environmental Education and New Jersey Education Association 180 West State Street Trenton, New Jersey 08608	K-12	X	X Part of 3 larger CBRU (computer resource units)		X (references)
New York					
Living Within Our Means: Energy and Scarcity University of the State of N.Y. State Education Department Albany, New York 12224	K-6 7-12		Related to regular instructional framework in all disciplines		Teacher
Coping with the Problems of the Technological Age. Parts I & II State Education Department Bureau of Secondary Curriculum Development Albany, New York 12224 (consumer education program)	9-12		Self-contained sources with activity		

Source	Grade Level	Background Material for Teachers	Activities	Charts Graphs	Bibliographies
North Carolina					
Environmental Education — Strategies for Wise Use of Energy Division of Science Education North Carolina Department of Public Instruction Raleigh, North Carolina 27611	K-12		Interdisciplinary activities	X	Teacher
Ohio					
Power Plants in Toledo and Guidelines for the Teacher Toledo Public Schools Environmental Education Program Manhattan and Elm Toledo, Ohio 43608	K-12				
Oregon					
Energy Crisis: Teaching Resources Oregon State Board of Education, Salem, Oregon 1973, available ERIC Clearinghouse on Social Studies 855 Broadway Boulder, Colorado 80302 (fiche 65¢/$3.25 hard copy)	K-Jr. College	X	Interdisciplinary lesson plans and activities		
Pennsylvania					
The Environmental Impact of Electrical Power Generation: Nuclear & Fossils John J. McDermott Science Education Advisor Pennsylvania Department of Education P.O. Box 911 Harrisburg, Pennsylvania 17126	9-12	X	Mini-course, extensive factual background	X	Teacher, Student
South Carolina					
Conservation Curriculum Improvement Project (CCIP) guides $3.95 each Albert H. H. Dorsey Curriculum Development Section South Carolina State Department of Education Room 801, Rutledge Building Columbia, South Carolina 29201	1-12		Energy topics in guides for: gr. 5, physical science gr. 9, social studies gr. 7, 8, 9		X

Source	Grade Level	Background Material for Teachers	Activities	Charts Graphs	Bibliographies
Tennessee					
Environmental Education Teachers Handbook Gr. 5 pp. 118-150 Lib Roller, Coordinator Environmental Education Department Metropolitan Public Schools Nashville-Davidson County Nashville, Tennessee 37204	9	Short articles	Includes four experiments		
Washington					
Energy and Man's Environment Thomas F. Ris, Editor Dr. John C. Jones, Project Director 4015 S.W. Canyon Road Portland, Oregon 97221	K-12		Interdisciplinary, stated in terms of objectives		
Project U.S.E. Sixth Grade Curriculum Outline: Energy and Man's Environment Bill Stocklin Project U.S.E. Bellevue Public Schools Bellevue, Washington 98004	6		X		Teacher, Student, Film. Also references to textbooks
Create Tomorrow Today – Energy Awareness Program of the Washington State Superintendent of Public Instruction March 1974 State Department of Public Instruction Old Capitol Building Olympia, Washington 98504			One week of energy awareness activities Interdisciplinary	X	X
Wisconsin					
Project I-C-E Project I-C-E 1927 Main Street Green Bay, Wisconsin 54301	K-12		Cross-discipline curriculum program with energy topics in physics, math, and biology sections		

APPENDIX B

Sources of Other Energy Curriculum Materials

AAAS Office of Science Education. **Energy and Society.** AAAS Office of Science Education, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036.
Grade Level 9-12

Currently being tested in Montgomery County, Maryland, this guide features individualized learning modules taking from two days to several weeks to complete. These activities are designed to be used in connection with regular courses. Includes background article reprint, student resource manual, and teacher's resource manual.

American Gas Association. **Experiments: Properties of Gas and Heat Energy.** American Gas Association, Educational Services, 1515 Wilson Blvd., Arlington, Virginia 22209.
Grade Level 8-12

A "spirit master" book of experiments using natural gas.

Center for Information on America. "The Energy Crisis: What Makes It So Complicated?" David S. Freeman. **Vital Issues.** November 1973.
Grade Level 9-up

Article reprints (35 cents each) and teacher's guide available from Center for Information on America, Washington, Connecticut 06793.

Changing Times Education Service. **This Energy Crisis: Is It Real?** $10.00. Changing Times Education Service, 1729 H Street, N.W., Washington, D.C. 20006.
Grade Level 9-12

An instructional mini-unit discussing reasons for increases in energy demand. Packet includes 40 copies of article reprint, black-and-white transparency, and a teacher's guide.

Committee for Environmental Information. **Energy, the Enduring Crisis.** 1974. Committee for Environmental Information, 438 N. Skinner Boulevard, St. Louis, Missouri 63130.
Grade Level 9-12

Sets of materials for teachers and students form self-contained teaching units on "The Energy Problem," and "Oil Case Study," "Energy Alternatives," and "Conservation." A list of additional reading is included.

Edison Electric Institute. **Energy-Environment Game.** $20.00 for school district. Available from: Dr. Richard Scheetz. Coordinator, Educational Services, Edison Electric Institute, 90 Park Avenue, New York, New York 10016.
Grade Level 7-12

The game includes: 32 players' guides, 1 teacher's guide, 32 role cards, 1 18-minute filmstrip, 1 record, 8 sets of source materials.

Edison Foundation. **Energy Conservation-Experiments You Can Do.** From Thomas A. Edison Foundation, Cambridge Office Plaza Suite 143, 18280 W. Ten Mile Road, Southfield, Michigan 48075.
Grade Level 5-10

Education Today Company, Inc. "Starting Points — Energy: Plugging into the Fuel Crisis," **Learning.** Vol. 2, No. 4, December 1973. Education Today Company, Inc., 530 University Avenue, Palo Alto, California 94301.
Grade Level K-8

Education Turnkey Systems. **Energy Education Series.** $79.50. Education Turnkey Systems, Inc., 1660 L Street, N.W., Suite 1213, Washington, D.C. 20036.
Grade Level Elem.

Eight monthly packets include: overheads, story records, activities, and experimental kits.

Energy Conservation Corps. 1835 K Street, N.W. Suite 302, Washington, D.C. 20006.
Grade Level 9-12

Sponsored by the Federal Energy Agency and the U.S. National Commission for UNESCO and administered by Bolton Institute, this is a pilot program being used in the New England states. Publications include a newsletter, short informational booklets, and suggestions for conservation activities.

Environmental Action Coalition. **Less Power to the People: Environmental Energy Use.** $2.50 members, $5.00 non-members. Environmental Action Coalition, 235 East 49th Street, New York, New York 10017.
Grade Level 4-6

Included are lesson plans and background information for the teacher, a bibliography and two classroom sets of Eco-News issue on Energy.

Educators Guide to Free Science Materials. NSTA, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009. 1973 ed. Two mini-units: "People and Power" and "Energy Crisis — A Chemical Problem."
Grade Level 9-12

These two mini-units designed by teachers use free materials from the guide.

Massachusetts Audubon Society. "The Curious Naturalist." Massachusetts Audubon Society, Lincoln, Massachusetts 01773.
Grade Level 3-5

This journal published monthly ($3.50 per year) through the school year will have a series of articles and activities on energy in 1974-1975.

Massachusetts Audubon Society. "Conservation Diary." **Conservation Leader.** December 1972. Lincoln, Massachusetts 01773.
Grade Level K-6

National Education Association. **Energy Choices for Now: An Introduction to Energy in the Environment.** $3.50. NEA, 1201 16th Street, N.W., Washington, D.C. 20036.
Grade Level K-6

A teacher's manual and student reader with activities serve as an introduction to the facts and problems associated with energy supply.

National Science Teachers Association. **Energy and Environment Packet.** $2.00 (Elementary Science Packet No. 6). NSTA, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009.

Grade Level 2-6

Contains various information booklets and suggested materials as well as a teacher's guide. (Sent to NSTA members.)

"Jelly Bean Ecology," **Science and Children** 10:12-14. March 1973.

Grade Level 4-6

Role-playing idea for teaching concept of energy consumption.

National Wildlife Federation. **Wind.** National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036.

Grade Level 3-6

One of the Environmental Discovery Series ($1.50 each), this booklet includes activities, experiments, and suggestions for discussion.

Rodale Press. **Recycling.** 1973. Rodale Press, Inc., Emmaus, Pennsylvania 18049.

Grade Level 3-6

Part of the Organic Classroom Series, this booklet discusses the need for recycling and suggests discussions and activities designed to teach that "nothing ever gets lost."

Youth Education, Inc. **Energy and Ecology: Are You Involved?** $6.95. Youth Education, 10 East 40th Street, New York, New York 10016.

Grade Level 9-12

Also distributed by Consolidated Edison and Pepco, this 60-page "spirit master" workbook includes puzzles, games, and simulations. A bibliography is included for further background.

APPENDIX C

Sources of Information and Low-cost Materials

Source	Sample of Materials Available
American Gas Association Educational Services 1515 Wilson Boulevard Arlington, Virginia 22209	Write for brochure: "Teaching Aids about Gas"
American Petroleum Institute 1801 K Street, N.W. Washington, D.C. 20006	"The Energy Gap," "One Answer to the Energy Crisis," "Energy," 16mm, sound film
Atomic Industrial Forum, Inc. 475 Park Avenue South New York, New York 10016	"Comparison of Fuels Used in Power Plants." Write for list of additional materials.
Concern, Inc. 2233 Wisconsin Avenue Washington, D.C. 20007	"Eco-Tips #7," Booklets on energy topics: "Fossil Fuels," $10.00/100; "Nuclear Energy," $12.50/100; "Solar Energy," $12.50/100, and "Geothermal," $7.50/100
Conservation Foundation 1250 Connecticut Avenue, N.W. Washington, D.C. 20036	
Edison Electric Institute Educational Services 90 Park Avenue New York, New York 10016	"Energy Conservation: Experiments You Can Do" and "The Energy Challenge: What Can We Do?"
Electrical Industries Association 6055 East Washington Boulevard Los Angeles, California 90040	"The Energy Saving Guidebook"
Energy Options EEG/EAG 1543 North Martel Avenue Los Angeles, California 90046	"Study on Energy Options" and wall chart: "Energy Options for Man," free with 9x12 self-addressed envelope
Federal Energy Administration Office of Communications and Public Affairs Washington, D.C. 20461	"Energy Saving Tips," "Fact Sheets" on such topics as solar energy, domestic oil and gas resources, energy from coal, etc.
General Motors Corporation Public Relations Staff Room 1-101 General Motors Building Detroit, Michigan 48202	"Professor Clean Asks—What Is Air Pollution?"
General Electric Company P.O. Box 500 New Concord, Ohio 43762	"Watts Going on Where You Live?" 50 copies at 10¢ ea
Interstate Oil Compact Commission Box 53127 Oklahoma City, Oklahoma 73105	"What Oil Conservation Means to You"
League of Women Voters 1730 M Street, N.W. Washington, D.C. 20036	"Energy Fact Sheets" nos. 1-10 15¢ ea or 25/$1

Source	Sample of Materials Available
Massachusetts Audubon Society Lincoln, Massachusetts 01773	**The Curious Naturalist,** elementary level periodical $3.50/yr.
Michigan State University Instructional Media Center Off Campus Booking East Lansing, Michigan 48824	"Invisible Force," free film, 16mm, sound (An historical view of man's energy use)
Minnesota Environmental Science Foundation 5400 Glenwood Avenue Minneapolis, Minnesota 55422	"Auto Environment and Values"
Mobil Oil Corporation 150 East 42nd Street New York, New York 10017	"A Primer on Air Pollution"
National Audubon Society Educational Services Department 1130 Fifth Avenue New York, New York 10028	"Conservation Fact Sheets" on such topics as: thermal pollution, water pollution, and conservation
National Coal Association Education Division 1130 17th Street, N.W. Washington, D.C. 20036	
National Education Association 1201 16th Street, N.W. Washington, D.C. 20036	"Environmental Education: An Annotated Bibliography"
National Science Teachers Association 1742 Connecticut Avenue, N.W. Washington, D.C. 20009	Write for publications list
National Wildlife Federation 1412 16th Street, N.W. Washington, D.C. 20036	Free bimonthly publication **Conservation News.** Also reprint: "Special Report on Energy" single copy free, additional 10¢
Nuclear Information Department Potomac Electric Power Company 1900 Pennsylvania Avenue, N.W., Room 510 Washington, D.C. 20006	"We're Glad You Asked" 35-page booklet answering questions about nuclear power plants
Oak Ridge Associated Universities Citizens Workshops P.O. Box 117 Oak Ridge, Tennessee 37830	Write for publications list
Owens-Corning Fiberglas Corporation Toledo, Ohio 43659	"The Energy Saving Game"
Phillips Petroleum Company Editorial Division 4A4 Phillips Building Bartlesville, Oklahoma 74003	"The Story of Oil and Gas"
Potomac Electric Power Company 1900 Pennsylvania Avenue, N.W. Washington, D.C. 20006	"Electricity: How to Get the Most for the Least"

Source	Sample of Materials Available
Public Service Electric and Gas Company General Manager, Information Service 80 Park Place Newark, New Jersey 07101	"The Atlantic Generating Station"
Reading Anthracite Coal Company Attention: Bob Baker Sales Promotion Manager 200 Manhantongc Street Pottsville, Pennsylvania 17901	"The Story of Anthracite," single copies for teachers and librarians only
Shell Oil Company Public Relations Department One Shell Plaza Houston, Texas 77002	Teacher-level background articles on energy topics and "The Story of Petroleum" for Grade 7, single copies for teachers and librarians
Shell Film Library 450 North Meridian Street Indianapolis, Indiana 46204	"Refinery Process," free film, 16mm, sound, 20 minutes
Standard Oil Company (Indiana) Mail Code 3705 200 East Randolph Chicago, Illinois 60601	"The Energy Crisis — What You Can Do About It"
Surface Mining Research Library 1218 Quarrier Street Charleston, West Virginia 25301	"Energy and Environment: What's the Strip Mining Controversy All About?" and "Basic Information Kit and Technical Information Kit"
Tennessee Valley Authority 706 Walnut Street Knoxville, Tennessee 37902	Packet of energy conservation materials
U.S. Energy and Research Development Association Technical Information Center P.O. Box 62 Oak Ridge, Tennessee 37902	Schools may obtain one complete set of 55 popular level booklets when requested on official school stationery. Also poster, pamphlet, and film lists.
U.S. Environmental Protection Agency Office of Public Affairs Washington, D.C. 20460	"Annual Gas Mileage Guide for Car Buyers," "A Report on Automotive Fuel Economy," "Health Effects of Environmental Pollution"
U.S. Department of Interior 18th and Connecticut Avenue Washington, D.C. 20240	"Energy, America and You"
U.S. Geological Survey Information Office Washington, D.C. 20244	"Natural Steam for Power," "Oil-shale a Potential Source of Energy," **Popular Publications of Geological Survey**
U.S. Department of Interior Bureau of Mines Motion Pictures 4800 Forbes Avenue Pittsburgh, Pennsylvania 15213	"The Minerals Challenge"
U.S. Public Health Service National Center for Air Pollution Control National Center for Urban Health 4th and Independence Avenue, S.W. Washington, D.C. 20201	"Air Pollution Experiments: High School Edition," 20 pp, $1.25

Also check your local gas and electric companies for other free materials.

APPENDIX D

Guide to Government Documents

Most, and quite possibly all, of the government reports and documents reviewed in the bibliographies are available through the Regional Government Library in your Congressional District. Should you wish to obtain personal copies, there are several possible sources:

1) The United States Government Printing Office (USGPO)

Orders may be sent by mail or, for faster service, phoned in to the order desk and picked up in person. When ordering a document, be sure to give the Stock Number and to include a check or money order for the exact amount required. The mailing address for the main Government Printing Office is:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

In addition to this main office, there are 12 regional bookstores. The locations are shown below:

Atlanta Bookstore
Room 100, Federal Building
275 Peachtree Street, N.E.
Atlanta, Georgia 30303
Telephone: 404/526-6947

Birmingham Bookstore
Room 102A, 2121 Building
2121 Eighth Avenue North
Birmingham, Alabama 35203
Telephone: 205/325-6056

Boston Bookstore
Room G25, John F. Kennedy Federal Building
Sudbury Street
Boston, Massachusetts 02202
Telephone: 617/223-6071

Canton Bookstore
Federal Office Building
201 Cleveland Avenue, S.W.
Canton, Ohio 44702
Telephone: 216/455-4354

Chicago Bookstore
Room 1463 — 14th Place
Everett McKinley Dirksen Building
219 South Dearborn Street
Chicago, Illinois 60604
Telephone: 214/749-1541

Dallas Bookstore
Room 1C46
Federal Building—U.S. Courthouse
1100 Commerce Street
Dallas, Texas 75202
Telephone: 214/749-1541

Denver Bookstore
Room 1421
Federal Building—U.S. Courthouse
Denver, Colorado 80202
Telephone: 303/837-3965

Kansas City Bookstore
Room 144, Federal Office Building
601 East 12th Street
Kansas City, Missouri 64106
Telephone: 816/374-2160

Los Angeles Bookstore
Room 1015, Federal Office Building
300 North Los Angeles Street
Los Angeles, California 90012
Telephone: 213/688-5841

New York Bookstore
26 Federal Plaza, Room 110
New York, New York 10007
Telephone: 212/264-3826

Pueblo Bookstore
Public Document Distribution Center
Pueblo Industrial Park
Pueblo, Colorado 81001
Telephone: 303/544-5277

San Francisco Bookstore
Room 1023, Federal Office Building
450 Golden Gate Avenue
San Francisco, California 94102
Telephone: 415/556-6657

2) Congressional Committees

A number of documents are printed each year for the use of a specific Congressional Committee that are not available from the GPO Offices. However, limited copies distributed free while the supply lasts, are generally available from the Committee which commissioned the report. Requests should be addressed to the Publications Officer of the appropriate Committee of the U.S. Senate, Washington, D.C. 20510, or U.S. House of Representatives, Washington, D.C. 20515.

3) Your Representative to Congress

Some reports and documents, such as those prepared by the Library of Congress Congressional Research Service, are available only through a member of Congress. As a rule, Congressmen are eager to provide their constituents with assistance and will frequently provide free copies of government hearings reports and background documents.

APPENDIX E

Keeping Current

A Guide to Energy-Environment Bibliographies and Subject Terms

1) The Environment Index (New York: Environment Information Center) Annual volumes in print, 1971 to present.

2) Applied Science & Technology Index (New York: H.W. Wilson Co.) Annual volumes in print, 1958 to date; also monthly issue.

3) Science for Society: A Bibliography (Washington: American Association for the Advancement of Science) Annual volumes in print, 1970 to present.

4) Selected U.S. Government Publications (Washington: USGPO) Issued bimonthly at no charge by the U.S. Superintendent of Documents.

5) Books in Print, A Xerox Education Publication (New York: R.R. Bowker & Co.) Published yearly in two volumes: Title/Publisher Index and Author Index.

6) Children's Books in Print, A Xerox Education Publication (New York: R.R. Bowker & Co.) Published yearly in two volumes: Title/Publisher and Author Index.

7) Reader's Guide to Periodical Literature (New York: H.W. Wilson Co.) Annual volumes in print, also monthly issue.

Subject Terms

These subject terms are suggested for energy and environment independent study searches of encyclopedias, card catalogs, and **Reader's Guide.**

Air pollution
Atomic energy
Atomic power

Coal
Coal gasification
Coal mines and mining
Coal supply
Conservation of energy

Electric power
Electricity
Energy crisis

Fuel

Gas, natural
Gas supply
Geothermal energy

Heat (heat and energy)
Heating
Hydroelectric plants
Hydroelectric power

Mines and mineral resources

Nuclear fuels
Nuclear fusion
Nuclear reactors

Oil
Oil lands
Oil pollution
Oil spills

Petroleum
Petroleum industry
Petroleum supply
Pollution
Power resources

Radioactive pollution
Radioactive waste

Smog
Solar energy
Solar furnaces
Solar heating
Strip mining
Sun

Thermal pollution
Tidal power

Water power
Wind power
Windmills

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"The Economy, Energy and the Environment," Library of Congress I-14
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